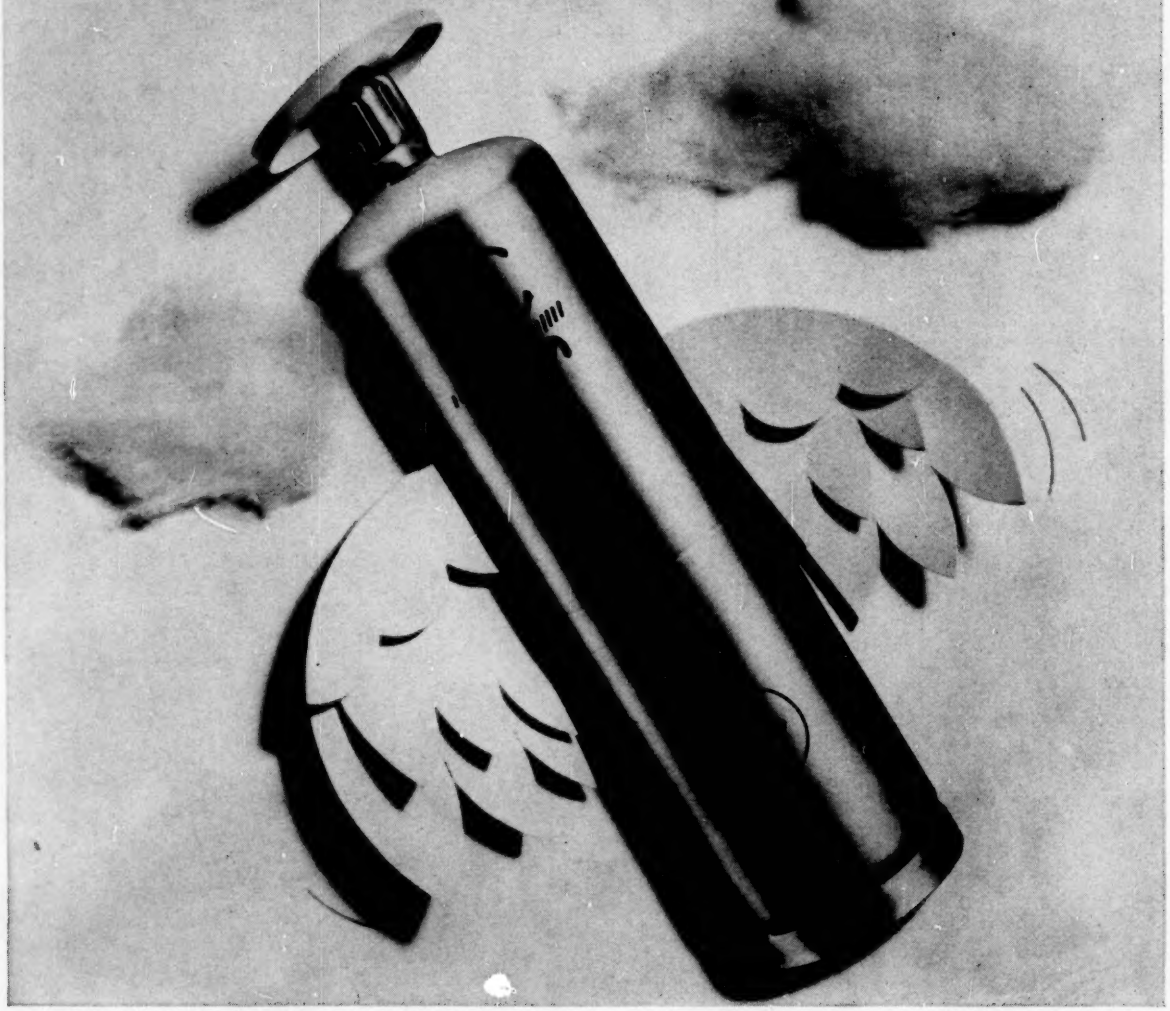
FEBRUARY
1961

Armour Ammonia

delivered 99.98% pure...at least!



To insure uniform high purity and top performance in your refrigeration system, *every* cylinder of Armour ammonia is tested *after* filling. This extra Armour quality test eliminates the possibility that moisture from ammonia will cause valve freeze-up...that oil film on evaporators and condensers will cut down efficiency...that non-condensable gases will boost head pressures and run up your power costs. Why take chances? Insist on pure, dry Armour ammonia...

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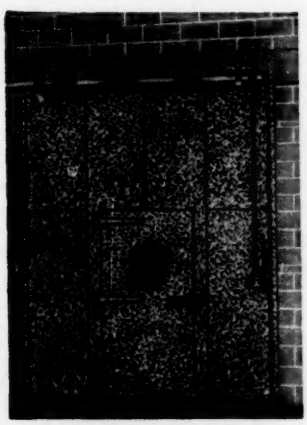
Armour Industrial Chemical Company

one of the Armour Chemical Industries

110 North Wacker Drive • Chicago 6, Illinois

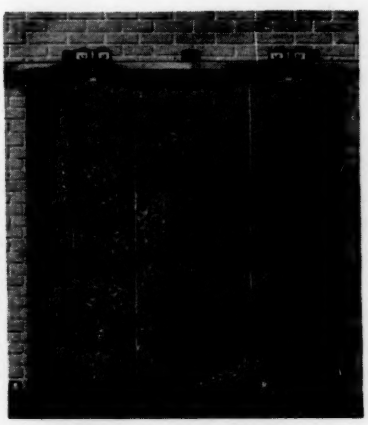
THE INDUSTRY'S FINEST...

ALL TYPES



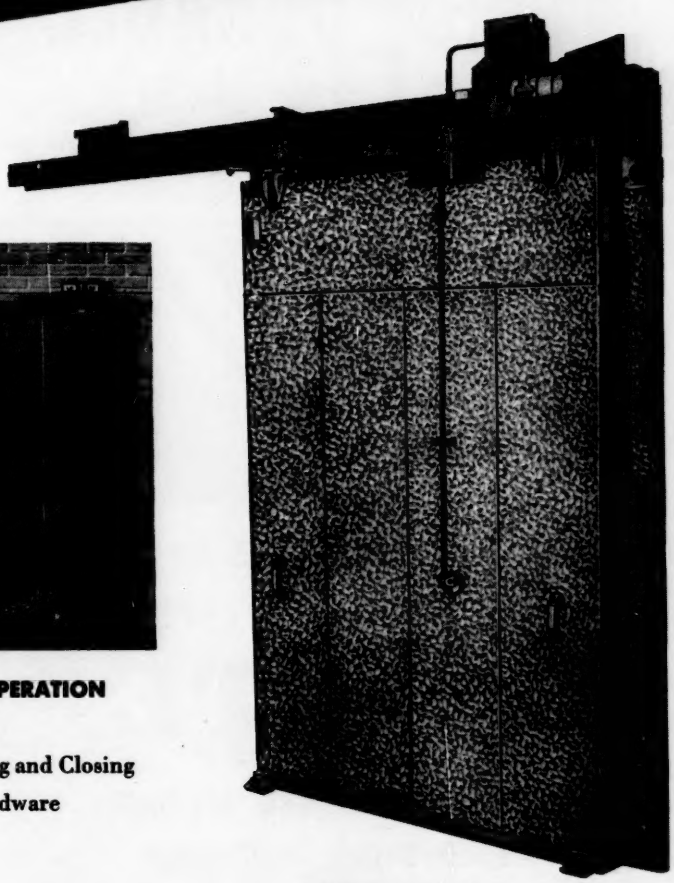
AIR OPERATION

- Safety Entrance and Exit Through Built-In Refrigerator Door
- Speedy Opening and Closing



MANUAL OPERATION

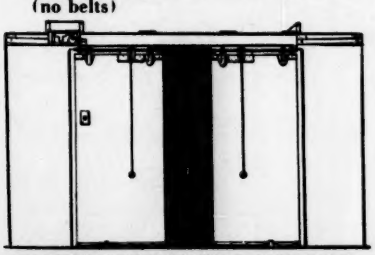
- Dependable
- Easy Opening and Closing
- Durable Hardware



Write for descriptive bulletin...

"Electro" SAFETY SLIDE

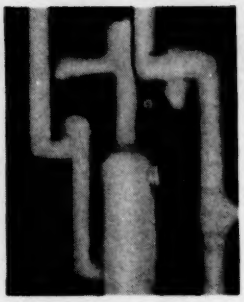
- Structural Simplicity
- Mechanically Sound
- Exclusive Automatic Sealing
- Gear Type Uni-Brake Motor Operation (no belts)



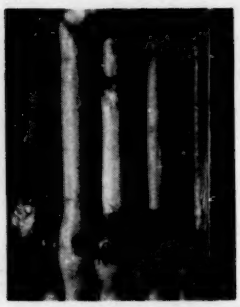
BI-PARTING "ELECTRO" SAFETY SLIDE DOORS

- Recommended where space factors dictate their use
- Gear Type Uni-Brake Motor Operation (no belts)

FLEXIBLE



Genuine OZITE installs easily without waste for valves, fittings, straight pipes . . . can be drawn tightly around unusual curves, bends and fittings.



DURABLE

Genuine OZITE is practically indestructible . . . will not deteriorate under heavy vibration or moisture.

CONSTANT

Genuine OZITE stops wasteful heat absorption. Helps maintain uniform temperature and increase refrigeration capacity.

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GENUINE

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A Product of American Hair & Felt Co.

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INTENDED USE_____

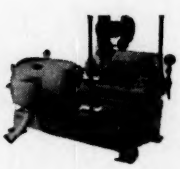
BIG LITTLE OR IN-BETWEEN

Creamery Package Engineering Means Lower Cost Refrigeration

Any job—for any temperature
60° below to 40° above

This assurance is backed by three generations of CP refrigeration know-how, advancement and *continuous user preference*. See Your CP Refrigeration Representative about your needs.

CP Type "K" Booster Compressors 4, 6 and 10 cyl. models, cap.* from 10 to 120 tons.



CP "VS" Compressors 2- 4- and 6-cyl. models in cap.* from 2 to 30 tons.

CP Type "K" Ammonia Compressors 4 and 6 cyl. models, cap.* from 10 to 200 tons.

*Depending on suction pressure.

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- **Plant Engineers and Operating Personnel**
- **Application Engineers and Contractors**

WHERE REFRIGERATION EQUIPMENT IS USED FOR:
- **Food Freezing, Storage and Transport**
- **Processing and Cooling Applications**
- **Research and Development**

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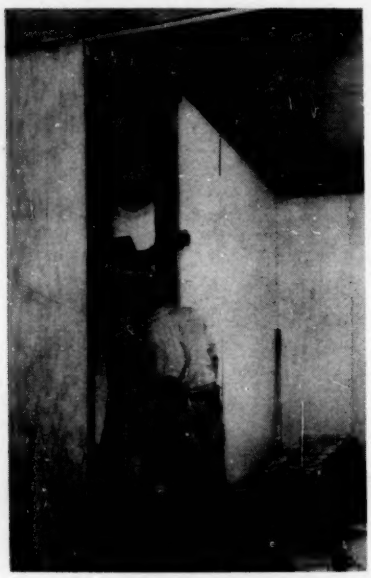
70 Years of Continuous Publication

New Products Designed to Improve Operation

Sandwich Panels

CLARKLITE sandwich panels provide many answers to the problems that confront architects, design engineers, manufacturers and builders. Economy, strength, insulation and versatility are some of the problems. These panels are stressed skin sandwich panels constructed with rigid Dylite expand-

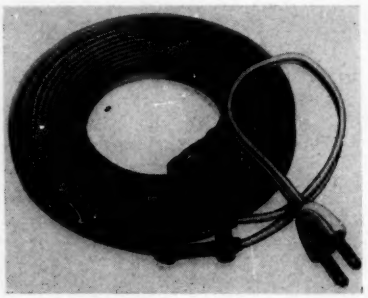


ed polystyrene cores made by a thoroughly tested foam-in-place technique. Panels are available in any size and thickness up to 8 feet by 20 feet by 10 inches. The panel surfaces may be selected from a wide variety of common finished or unfinished sheet materials, such as plywood, gypsum board, masonite, aluminum or steel.

Economy is the one thing most people are seeking. CLARKLITE panels are easily erected, joined and finished, which will result in definite savings in time and material.

The panels are extremely tough and shock resistant. The Dylite core may be varied in density from one to ten pounds per cubic foot to provide required strength, insulation and rigidity. Panels are manufactured to provide either structural or non-structural components or units. The panel design is based on engineering data and manufacturing techniques developed by Koppers Company, Inc., Pittsburgh 19, Pennsylvania.

Heating Bands For Drain Tubes



A COMPLETE new range of electric heating bands for supplying supplementary heat to the drain tubes of low-temperature cooler coils has been introduced by Easy-Heat, Inc., Lakeville, Indiana manufacturer of electric antifreeze devices.

The heating bands are available in lengths of from 3 to 100 feet for 110 V; from 6 to 200 feet for 220 V. Each dissipates 7 watts per foot.

The heat band is a waterproof, molded vinyl band which holds pre-spaced heater wire safely in place, in separate channels. All connections and end are hermetically sealed, and the unit comes already attached to a cold lead wire and molded plug.

Multi-Point Controller

THE new Thermo Electronic Multi-Point Temperature Controller developed by Thermo Electric Co., Inc., provides accurate auto-

matic two-position control for up to ten separate processes . . . saves initial investment, panel space, and cuts installation, operation and maintenance time.

The instrument can also be used as a single point controller, a five-point three-position controller and a manual-balance indicator. Any points not being used for control of a multiple-temperature process, can monitor other processes.

The Multi-Point Controller combines a sensitive null-balance potentiometer measuring circuit with an electronic control system. It is adaptable to any installation requiring off-on control. Accuracy is 0.5% of range. Calibrated range scales are available for all standard thermocouple materials.

Standardization is continuous by means of a highly stable constant voltage supply unit.

For maximum operating convenience all controls and switches are located on the front panel of the instrument. In addition, ten white lights show scanning position, ten red lights show process condition and ten knobs provide for quick, easy setting of control points.

In operation, input signals are scanned in sequence, at the rate of 3 seconds per point, and compared to slide-wire control settings. Other scanning rates available. Signal deviations are amplified in accordance with their polarities by the high gain, sensitive Thermo Electronic relay control amplifier. The amplified signals provide corrective action through ten load relays connected to the processes being controlled.

Accessories include load-relay panel, profile recorders, heaters, control valves and many others.

Rubber Boot For Tubular Heaters

A MOLDED rubber boot is being offered by the General Electric Company which makes it possible to use tubular heaters for refrigeration defrosting and other applications requiring moisture protection.

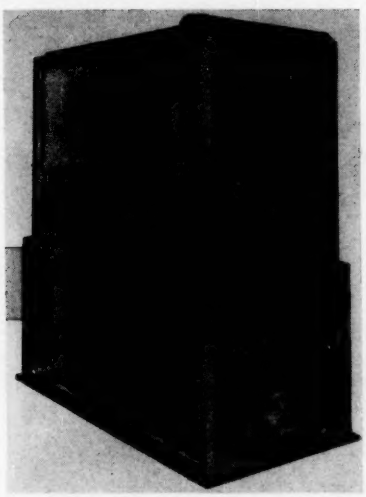
Designed for operation from -40 to 185 F by protecting the heater terminal connections from frost or moisture accumulation, the rubber boot is free of taste or odor and is oil resistant, according to engineers at the company's Industrial Heat-

ing Department. The boot is 1¾ inches long and 7/16 of an inch in diameter.

Tubular heaters with 0.260 and 0.315 inch diameters of steel, stainless steel, Incoloy, Inconel and Aluminum sheaths can be supplied with the new boot although special diameters are available on request.

Cracked Ice Machine

A SIMPLIFIED method of producing cracked ice while eliminating the inefficiencies of cube and flaked ice has been made possible through the introduction of the new Tippmann Plate Ice Maker.



This machine produces cracked, hard, sanitary ice with no snow or slush. The cracked ice produced is non-uniform in shape averaging ⅝" to 1½" x ⅝" thick and weighs approximately 36 lbs. per cubic foot.

Not only is cracked ice more practical and economical for packers, hospitals, hotels, fisheries, poultry processors, and other industries that require large quantities of ice, but it can be produced at a lower cost—$1.25 to $1.75 per ton. Ice companies find this type of cracked ice to be more profitable as it can be dispensed without additional processing.

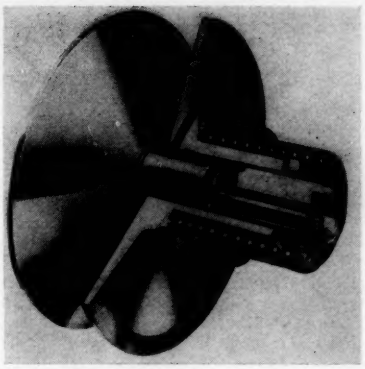
Operation is simple and economical as the water used for defrosting is automatically pre-cooled for the next cycle. Ice is formed in sheets about ⅝" thick and dropped into an ice crusher at the bottom of the unit. The freezing cycle is 20 to 40 minutes.

This machine complies with ASME Codes. It will operate in any above-freezing location, requires no refrigerant seals, employs no moving parts in the freezing and harvesting of the ice and is rust-free.

Available in 1 to 200 ton (per 24 hours), single or multiple units, to meet any tonnage requirements and for use with ammonia or Refrigerant 12 and 22. Unit is compact and requires only 8 ft. x 9 ft. x 8 ft. for a 30-ton unit.

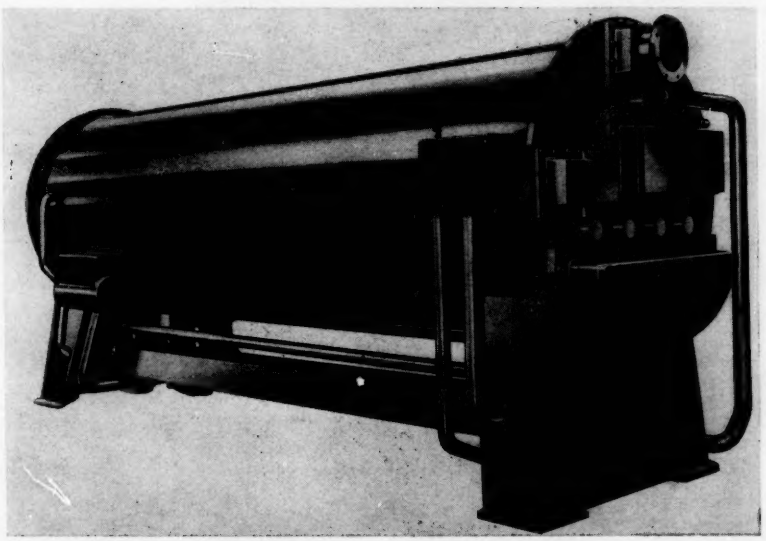
Variable Speed Motor Pulley

STERLING Electric Motors, Inc. has announced that Sterling variable speed motor pulley drives, designed for simple, economical and dependable variable speed operation, are now available in ratings of from 1 through 15 horsepower. Output speeds range from 2200 rpm to 141 rpm with a 3 to 1 speed variation utilizing 1750 rpm or 1160 rpm motors.



Incorporating the efficient power transmission of a V to V drive and a simple motor pulley design, these new Sterling Variable Speed Motor Pulley Drives provide reliable power transmission combined with maximum horsepower capacity. Applications include centrifugal pumps, presses, hoppers and shakers, food processing machinery.

500 Ton Absorption Unit



THREE new sizes of absorption "Cold Generators"—in capacities of 400 tons, 455 tons and 530 tons—have been announced by The Trane Company, La Crosse, Wis. The new units expand the line to 12 basic sizes in the 100- to 530-ton range.

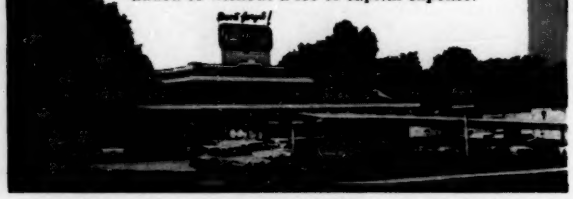
The rapidity with which the absorption "Cold Generator" has gained acceptance since its introduction in 1959, is the main reason for future expansion of the line, according to the manufacturer, who reports sales figures have exceeded by 50 per cent the anticipated goals.

The three new sizes feature the same single-shell, hermetic design as the original nine sizes introduced in 1959. The single-shell arrangement reduces machine height, permitting installation in low-ceiling areas, the company said. Hermetic design prevents air leakage, thus maintaining full-rated capacity and resisting internal oxidation.

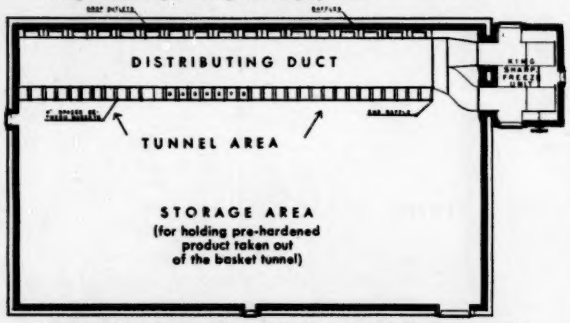
In addition, the company states, the absorption Cold Generator is completely automatic.

HARDENING TIME
REDUCED 75% WITH
KING
ZONE TUNNEL

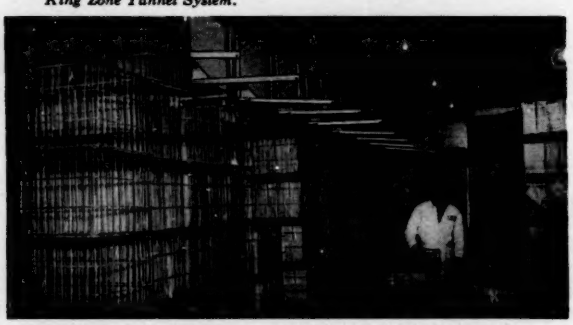
Midwest Dairy Products, a division of City Products Corp., has recently converted three plants, Memphis, Tenn., Ruston, La., Duquoin, Ill., to *King Sharp Freeze and Zone Tunnel Systems*. According to Thomas Cartwright, Chief Engineer of Midwest Dairy Products, "the *King System* with the *King Zone Tunnel*, has decreased hardening time from 36-48 hours to 8-10 hours . . . (and) increased the hardening room storage capacity by 25% to 30% due to the stacking procedure used." Mr. Cartwright also pointed out that the flexibility of the *King System* combined with the *King Zone Tunnel* was particularly desirable because "it can be added to without a lot of capital expense."



This Fortune Ice Cream plant in Memphis was the first Midwest Dairy Products plant to get a King System.



Typical plan of combination hardening room and storage area with *King Zone Tunnel System*.



Section view of *King Zone Tunnel* showing basket stacking arrangement. *Air Blast* through product produces rapid hardening and improved quality.

Write for *detailed technical bulletins.*
50 years experience is at your service.

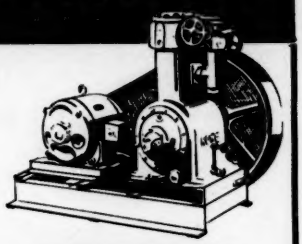
King COMPANY OF OWATONNA
907 North Cedar Street • Owatonna, Minnesota

STAY AHEAD OF COMPETITION HERE'S HOWE!

HOWE REFRIGERATION works in so many fields—where compressors and components have vastly different jobs to do—that experience gained in one field often helps solve problems in other fields.

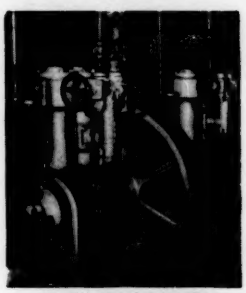
HOWE'S broad and long (48 years) experience is one way our engineers can help you stay ahead of competition. Let us demonstrate the value of this specialization by bringing you more efficient operation and better profits. *It pays to know HOWE!*

WRITE FOR LITERATURE

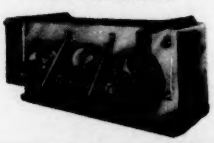


COMPRESSOR ASSEMBLIES
Capacities to 60 H.P.

POLAR CIRCLE COILS
For freezer storage as well as normal temperature work



HOWE COMPRESSORS
For every size load and application. 5 to 150 tons



HOWE 3-Fan UNIT COOLERS
For heavy duty, high tonnage blast freezing, freezer storage.

HOWE ICE MACHINE CO.

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news briefs of the month

Power From Waste Heat With Lead Telluride

A dream of physicists and electrochemists is about to become a commercial reality. The Winter issue of "Lead", quarterly publication of the Lead Industries Association, carries a feature article on *thermo-electric generators*–small pellets of lead telluride that convert waste heat directly to electric power without any moving parts. Among the use possibilities seen for these devices by the developer, Minnesota Mining and Manufacturing Co. are auxiliary power supplies to drive fans, water pumps, oil burning equipment, ignition and lighting power for cars and, by using the element in reverse, "refrigerators" small enough to rest on your thumb.

Preserving Fish With Refrigerated Sea Water

Refrigerated sea water equipment for preservation and storage of fish at sea is proving more and more useful, particularly in vessels which range far from their home ports. British Columbia skippers have for some time benefited from the continuing experiments and improvements in this fish-holding technique carried out at the Vancouver Technological Station of the Fisheries Research Board of Canada. Recently members of the staff of the Vancouver station have been holding discussions with fishermen on the brine freezing of fish on larger halibut vessels, an idea which has received favorable reaction from vessel operators. A pilot model brine freezer has now been set up and is in operation at the station.

Planning For Profits Theme IAICM Meeting

"Planning for Profits" is the theme for the District Accounting Conferences scheduled for this year to be held in seven different regions of the United States. In addition, there may be an eighth conference in Canada. State and local dairy associations are joining with the Milk Industry Foundation and the International Association of Ice Cream Manufacturers in sponsoring them.

The first conference will be held in Pittsburgh on February 23 and 24. The Pennsylvania Association of Milk Dealers and the Greater Pittsburgh Dairy Industry Association will include discussions and papers on 12 different subjects.

Warehouse For Cut Flowers Expanded

A $40,000 expansion program by one of Port Dover's, Ontario, leading industries is nearing completion. Thomas A. Ivey and Sons, Ltd. distributors of cut flowers, has added 8,000 feet of floor space to enlarge cooling and handling facilities. An additional 4,000 square feet of floor space has been added to the firm's supply department warehouse. Cooling rooms, where the flowers are kept prior to shipment, have been enlarged by 2,500 square feet. The new additions have greatly increased the firm's grading and handling capacity, C. E. Strople, company treasurer, said.

Miniature Vacuum Recorder Introduced

Hastings-Raydist, Inc. has a new miniature Vacuum Recorder which is only 3⅜" wide and 5⅝" high. It is suitable for bench, desk or panel mounted installations. Miniaturization of the Compensated Thermopile Vacuum Gauge circuitry made this self-contained instrument possible. It comes in 0–1000 micron Hg and 0–20 mm Hg pressure ranges. Full voltage regulation is incorporated in the circuitry and gauge tubes, it is said, will withstand tremendous shock and vibration without breakage. Operation is from 115 volt a-c 60-cycle line.

Front Cover

Our front cover photo shows the United States Industrial Chemicals Company's new 7,000 ton ammonia storage tank-inside-a-tank being constructed at Tuscola, Illinois. The tank uses the relatively new technique of storing refrigerated ammonia at atmospheric pressure rather than storing it in pressurized tanks at moderate temperatures. Under construction is an inner tank, 88 feet in diameter and 56 feet high which holds the ammonia. This tank is surrounded by 2½ feet of insulation, and another steel tank which keeps moisture out of the insulation. The ammonia is maintained at a temperature of minus 28°F. by surface evaporation of the ammonia itself. The evaporated ammonia is recompressed, condensed, and recirculated to the tank.

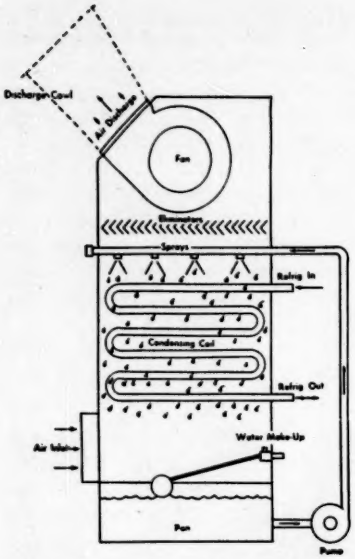


Fig. 1—"Draw-Thru" centrifugal fan evaporative condenser.

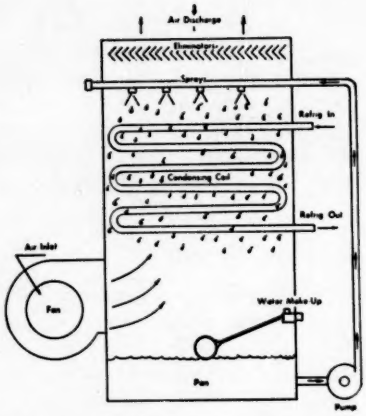


Fig. 2—"Blow-Thru" centrifugal fan evaporative condenser.

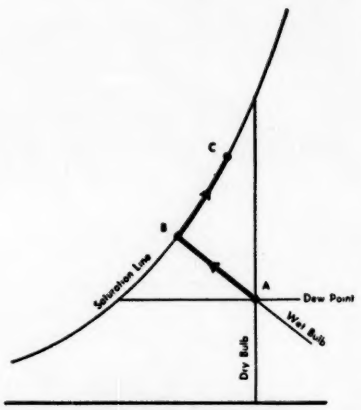


Fig. 3—Psychrometric analysis of air path through condenser.

Evaporative Condenser Design Selection Installation

From
Baltimore Aircoil Co. Inc.
Engineering Manual

»» THE evaporative condenser has proved to be one of the most modern means of conserving water in the air conditioning and refrigeration industry. It was designed to alleviate the problems arising from the use of water cooled condensers which waste the cooling water to the sewer.

In water cooled condensers, the heat extraction depends entirely on the water sensible heat gain. With an average water temperature rise of 20°, there is an equivalent "pick-up" of approximately 20 Btu/lb. of water. In the evaporative condenser, however, the heat extraction depends on the evaporation of water. Since it takes approximately 1,000 Btu's to evaporate one pound of water, the "pick-up" is 1,000 Btu's per pound instead of 20.

This one pound of water in an evaporative condenser theoretically does the equivalent work of 50 pounds of water in a water cooled condenser, or the evaporative condenser requires only 2% of the water required in a water cooled condenser. In actual practice, however, this theoretical saving cannot be attained. Through both evaporation and "bleed-off" the water used in evaporative condensers approaches 5% of that used in water cooled condensers.

As water evaporates it leaves behind its impurities. Also, the air washing of fumes that pass through the unit will leave impurities in the water. This causes a continual build-up of chemicals that can be either alkaline or acidic. Scaling or corrosion may occur at a rapid rate if the impurities are allowed to become too concentrated. Normally, it is good engineering practice to bleed off as much water as is evaporated, thus causing a constant change to fresh water and preventing the build-up of impurities.

Design of Evaporative Condensers

Basically, the evaporative condenser is a cooling tower in which is incorporated a condensing coil. It may be either a "Draw-Thru" or "Blow-Thru" type. The principle of operation is the same in both cases, with only the location of the fan being changed as the name implies.

Fig. 1 shows the basic components of an evaporative condenser. The circulating pump draws water from the pan and forces it through the spray header and branch circuits. Spray nozzles, evenly spaced over the coil of the evaporative condenser, discharge

the water in minute droplets onto the coil surface. Depending on the type of condenser (Figs. 1 and 2), the fan either draws or forces air in through the falling water and through the coil surface. The air evaporates the small quantity of water required for cooling, but also carries along with it some unevaporated spray water. This entrained spray water is removed from the air in the eliminator section and eventually drips down into the pan. Make-up water is introduced through the float valve as the water is evaporated.

Centrifugal fan "Draw-Thru" units (Fig. 1) have the smallest base area and are normally used when restricted floor space prohibits the use of "Blow-Thru" units. When these units are to be installed outdoors, discharge cowls should be used to recover normal velocity pressure losses. This static regain results in improved fan efficiency and considerable savings in fan horsepower. On indoor applications, recommendations are furnished with each unit for attaching ductwork to gain the same effect.

"Blow-Thru" evaporative condensers are of either centrifugal or tubeaxial fan design. "Blow-Thru" units have their moving parts (fans, shafts, bearings) in the dry entering air, rather than in the saturated discharge air, which increases the life of these parts. Also, the moving parts of these units are more accessible for maintenance because they are conveniently located near the floor.

Since centrifugal fans are quieter than tubeaxial fans, the centrifugal fan "Blow-Thru" (Fig. 2) units are recommended for most applications.

The tubeaxial fan units require considerably lower fan horsepower than the centrifugal fan units and are recommended for industrial applications where low sound levels are not as important. These units are constructed only in larger sizes where the horsepower savings is of consequence.

Basic Thermodynamics

Without going too deeply into theory, Fig. 3 traces the condition of the air as it passes through the evaporative condenser. It is assumed that the air enters the condenser at some unsaturated condition, Point "A." Before reaching the coil surface, it is washed with falling water; and by the time it enters the coil it can be assumed for convenience, that it is saturated adiabatically, Point "B." Then as it passes through the coil, it absorbs heat from the coil and the surrounding water. This increases the total heat content of the air, and since it is continually being washed with falling water, the process follows the saturation line. The final temperature of the air leaving the condenser, Point "C," depends on the quantity of air used which is dependent upon the design of the condenser.

From the above discussion, it is seen that the performance of an evaporative condenser depends entirely on the load imposed upon it and the wet bulb temperature of the entering air. The air dry bulb temperature or relative humidity has no effect on the capacity of the unit.

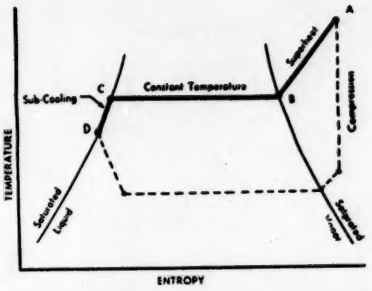


Fig. 4—Temperature-Entropy diagram showing theoretical refrigeration cycle (solid line shows path of refrigerant through condenser).

Refrigeration Cycle

Fig. 4 shows a typical refrigeration cycle on a temperature-entropy diagram. The refrigerant enters the condensing coil at a superheated condition, Point "A." The superheat is removed, and the saturated vapor condition, Point "B," is quickly reached. As it progresses farther through the coil, it begins to condense along a constant temperature line "B-C" until reaching a completely liquid state at Point "C."

Theoretically, the function of the condenser is now complete, but actually most condensers are designed with sufficient coil surface to produce a certain amount of liquid subcooling, indicated by Point "D." Condensers are designed to produce approximately 10°F subcooling under normal operating conditions with Refrigerants 12 and 22.

Selection

In the "once through" type water cooled condensers, small increases in capacity can be attained due to "unlimited" water supply. As the load increases, the water regulating valve opens wider, passing more water through, and thus increasing the capacity of the condenser. But the cost of this flexibility can be expensive because the condensing water is continually dumped into the sewer.

In an evaporative condenser the capacity is substantially fixed, and there is no simple way to obtain increased capacity. Therefore, the selection should always be based on maximum load conditions along with the desired head pressure and the design wet bulb temperature for the locality. Evaporative condensers are designed with sufficient safety factor to take care of occasional seasonable load fluctuations or wet bulb temperatures which occur over and above the design conditions.

The capacities of evaporative condensers are given in terms of tons of refrigerating effect. Actual design is based on 14,300 Btu/hr. condenser heat rejection per ton for Refrigerant 12 or 22 at 105° condensing, 40° suction and 78° air wet bulb temperature.

Summer Operation

The operation of an evaporative condenser during the summer season only is one of the more common applications encountered. Satisfactory performance will result if the selection is based on *maximum load conditions* along with the desired operating refrigerant temperatures and the design wet bulb temperature for the particular locality.

Winter or Year-Round Operation

Some additional considerations must be made when an evaporative condenser is selected for year-round operation. Since this type application is usually low temperature in nature, the frequency of the

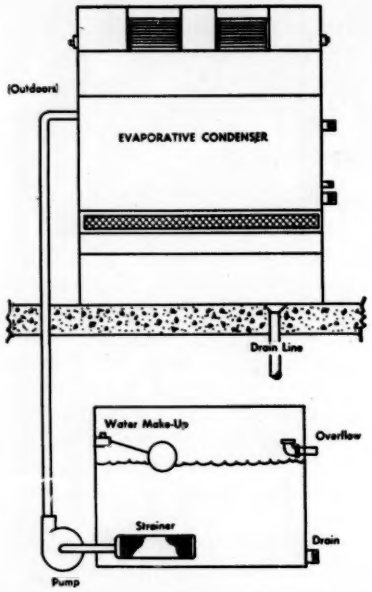


Fig. 5—Remote pump and auxiliary tank arrangement on an evaporative condenser installation for year-round operation.

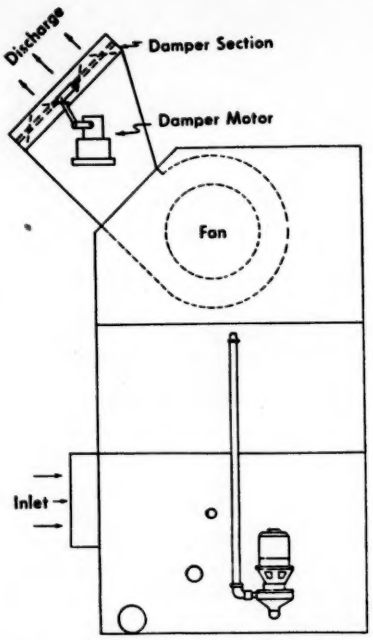


Fig. 6—Modulating damper control on "Draw-Thru" evaporative condensers.

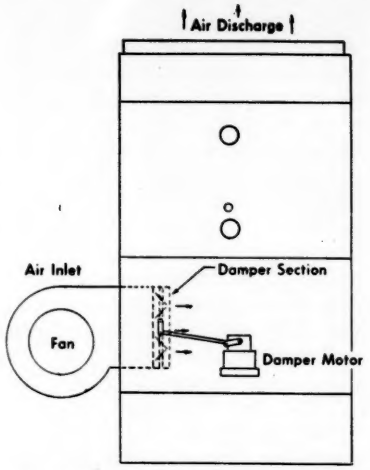


Fig. 7—Modulating damper control on "Blow-Thru" evaporative condensers.

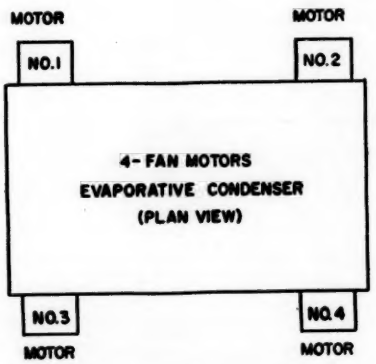


Fig. 8—Four fan units must be operated with all four fans or with fans 1 and 3 or fans 2 and 4 together.

"pull down load" should be considered. If the "pull down load" is frequent and is a part of the normal operating procedure, the condenser should be selected for *this load* rather than for the normal operating load.

A most satisfactory installation for year-round operation is the use of an auxiliary sump tank and pump located within a heated space. Fig. 5 shows a typical arrangement. With this method, the condenser drain is connected so that the water from the condenser sump always drains directly to the auxiliary tanks. This prevents freezing during shut-down periods.

In this type installation, care should be taken in the selection of the remote pump. The standard pumps on evaporative condensers are capable of delivering only the required gallonage when mounted on the condenser, and, therefore, are not suitable for remote installations. The pump must be selected to give the required total head which should include the vertical lift, pipe friction (in the supply and suction lines) plus 5 psi which is the pressure required at the spray header.

Capacity Control

On applications where there are large load variations, and a constant head pressure must be maintained, some form of capacity control is necessary.

Modulating dampers located on the fan discharge are the most desirable and the recommended method of capacity control. A modulating condensing pressure sensing element controls the damper motor and dampers, which in turn regulate the air flow through the evaporative condenser. With this control method, an infinite number of steps of reduced capacity can be obtained (See Figs. 6 and 7).

During winter, when the load is reduced and the ambient wet bulb temperature is far below design conditions, the evaporative condenser may be operated dry. This reduces capacity of the unit to more nearly match the reduced load. The combination of wet and dry coil operation with damper control will give excellent capacity modulation over a wide range of conditions.

On large units with four fan motors, an additional step of capacity control may be obtained by shutting down two of the fan motors. This will reduce the unit capacity by 50%.

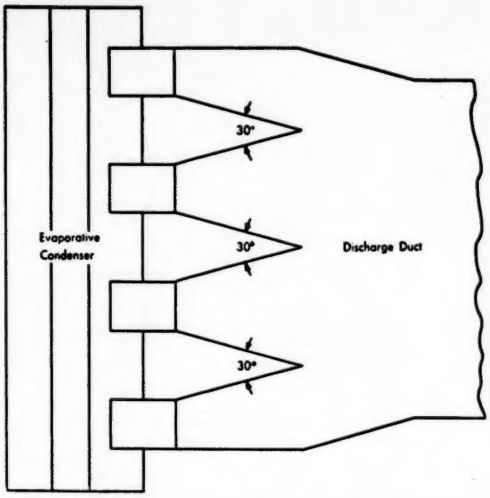
Caution: When units have more than one fan motor:

Two-Fan Motor Units—Do not Operate One Motor At A Time. Operating one motor may cause overloading and/or may cause water to be blown out of the unit through the other fan intakes.

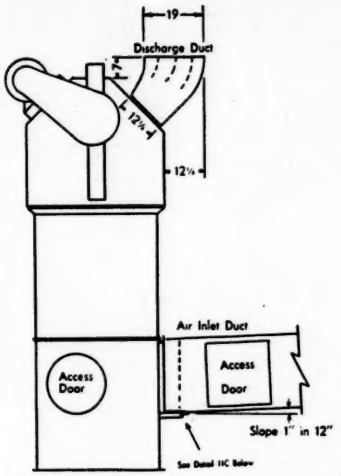
Four-Fan Motor Units—Operate All Four Motors, Or Just Motors No. 1 And No. 3 Together, Or Motors No. 2 And 4 Together (See Fig. 8). Do Not Operate Any Other Combination Of Motors.

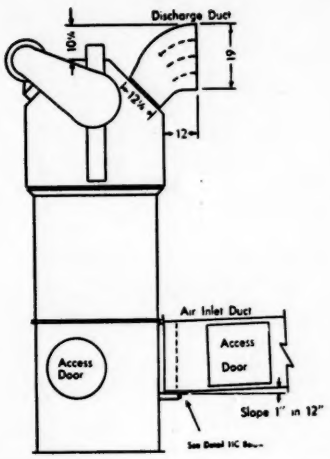
Location

Basically, the evaporative condenser is an outdoor piece of equipment and it should be installed outdoors whenever possible. Sometimes it is necessary to locate a unit indoors due to space limitations and/or to facilitate a means of building ventilation. In this type

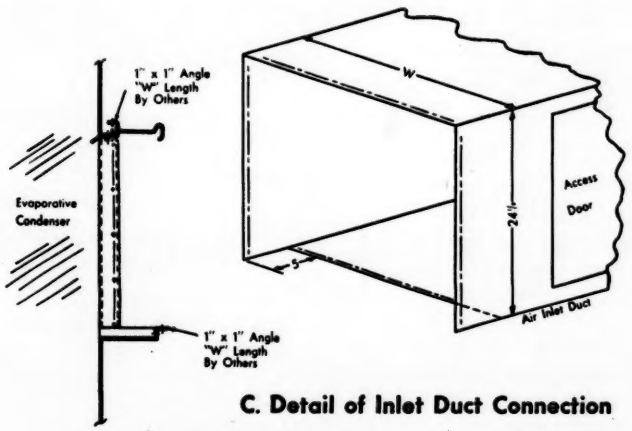


A. Plan View Showing Discharge Duct





B. Inlet and Discharge Ducts



C. Detail of Inlet Duct Connection

SINGLE INLET UNITS

Unit No.	W*
10 – 25	35½"
30 – 50	71½"
60 – 100	143½"

*Inside Duct Dimensions

Fig. 9—Schematic diagram indicating recommended duct connections on "Draw-Thru" evaporative condensers.

installation, adequate provisions should be made for unrestricted air flow to the unit. Indoor installations require ductwork for the discharge air, but supply ductwork to the unit may not be necessary if the room can be used as a plenum.

Either "Draw-Thru" or "Blow-Thru" centrifugal-fan units may be used indoors.

In any case, whether the condenser is installed indoors or outdoors, the following points should be taken into consideration when locating it:

1. There should be sufficient free and unobstructed space around the unit for proper servicing.
2. There should be a free and unobstructed path for the flow of the air to and from the condenser.
3. The discharge air should not be deflected in any way that might cause short circuiting of the air flow. The possibility of air recirculation should be particularly considered on multiple condenser installations.

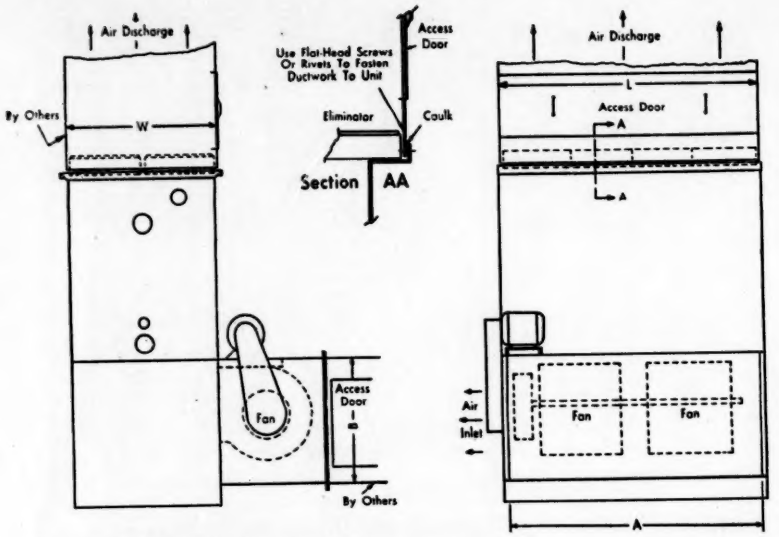
Ductwork Connections

Figs 9 and 10 show recommended ductwork connections to "Draw-Thru" and "Blow-Thru" evaporative condensers.

In the "Draw-Thru" evaporative condensers, a "Y" type, or "pants" type transition to the main discharge duct is required for two-fan units, and a multiple "Y" type for four-fan units as shown in Fig. 9A. Outlet ducts from all fans should expand outward as shown to allow recovery of normal velocity pressure losses. When making a 45° turn on the outlet ductwork to the vertical or horizontal, the minimum size transition piece should be fabricated in accordance with dimensions shown in Fig. 9B.

When inlet ductwork is required on "Draw-Thru" units, the duct should be pitched down to the unit approximately 1" in 12" of length to allow positive drainage of any moisture into the pan section (see Fig. 9B and 9C). An access door should be provided in the ductwork for removing the inlet louvers.

To install discharge air ductwork on "Blow-Thru" evaporative condensers, the duct is fastened just inside the eliminator retaining flange as shown in Fig. 10. An access door should be provided in



OUTSIDE DUCT DIMENSIONS

Unit No.	A	B	L	W
10 – 25	32½"	31"	35⅛"	42"
35 – 50	68⅛"	31"	71⅛"	42"
60 – 100*	140½"	31"	143⅛"	42"
125 – 175**			143⅛"	57½"
200 – 350			143⅛"	109½"
400 – 700			287⅛"	109½"

*Model CMA
**Also Model CPA 75-100

Fig. 10—Schematic diagram indicating recommended duct connections on "Blow-Thru" evaporative condensers.

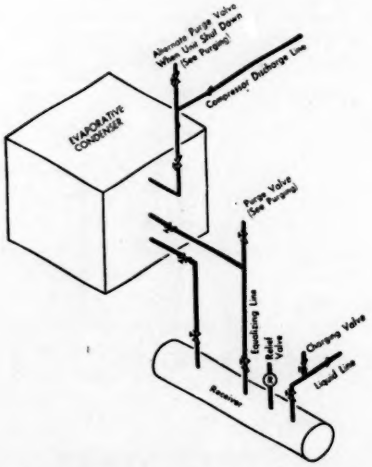


Fig. 11—Case I: Single evaporative condenser with one or more compressors.

the ductwork for removing the eliminators and maintenance of the upper interior of the unit.

Caution: Special care should be taken in the design of ductwork to and from units. When two or more units are installed indoors, use separate ductwork for each. Avoid a common discharge or intake duct if possible. Joining ductwork of two separate units can cause uneven air flow and improper operation of one unit because of varying static pressure.

Also, ductwork attached to each unit should be designed so that there is even air distribution across the entire intake and exhaust. Use turning vanes in all turns to ensure good distribution and minimum pressure drop.

Refrigeration Piping

The following piping recommendations should be followed when installing evaporative condensers:

1. Pipes should be adequately sized according to standard commercial practice.
2. The piping should be laid out so there will be a certain amount of flexibility between the component parts of the system, allowing for vibration, expansion and contraction. Never lay out piping so it is completely rigid.
3. The liquid from the condenser to the receiver should be larger than the liquid line to the evaporator. This along with proper equalizing lines (shown in Figs. 11, 12 and 13) will prevent gas binding and liquid back-up in the condenser.
4. In the liquid line from the condenser to the receiver, the valves should be located in a vertical section of the line. If it is necessary to place a valve in a horizontal section of the line, the valve stem should be in a horizontal plane.
5. When two or more parallel compressors are used with any number of evaporative condensers, always cross-connect the discharge lines at the compressors according to standard practice. Then use a single discharge line to carry the hot gas to one or more condensers.

The following are typical examples of proper piping for evaporative condensers.

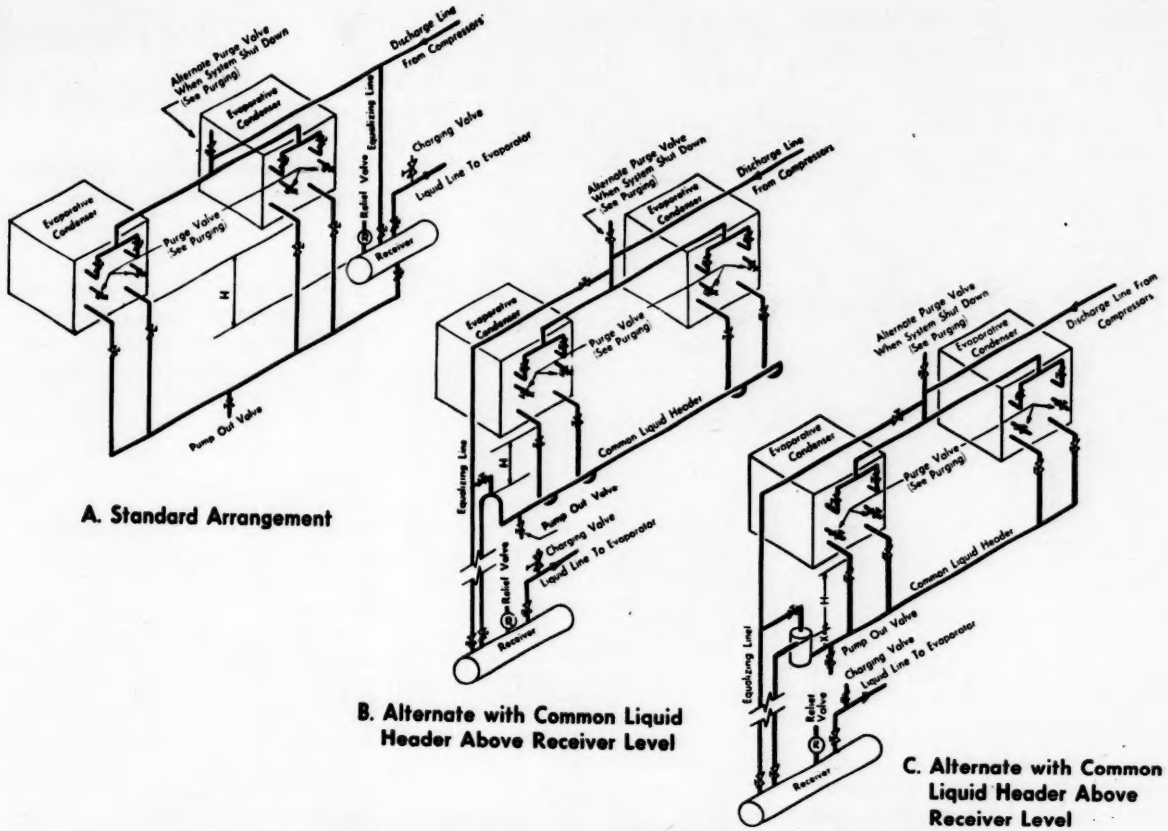
Case I: Single Evaporative Condenser With One Or More Compressors.

Fig. 11 indicates the recommended piping hookup for one or more compressors discharging into a single evaporative condenser. Each circuit of an evaporative condenser is provided with a ½" connection at the coil outlet. With single-condenser hook-ups, this connection should be used as both an equalizing and a purge connection.

Connect the equalizing line between the receiver and the ½" connection. This will relieve the receiver of any gas binding that might occur.

Install a purge valve at the high point of this line as shown in Fig. 11. An alternate purge valve, for use when the system is shut down, should be installed at the high point of the system as shown in Fig. 11.

Note: When two or more condensers are piped for parallel operation, or if a single condenser has two or more circuits with different loads, use the ½" connections for purging only. Do not use for equalizing (see cases II and III).



A. Standard Arrangement

B. Alternate with Common Liquid Header Above Receiver Level

C. Alternate with Common Liquid Header Above Receiver Level

Fig. 12—Case II: Paralleling evaporative condensers (any size) with one or more compressors.

Case II: Two Or More Evaporative Condensers in Parallel

Fig. 12A shows the standard recommended piping arrangement for paralleling two or more evaporative condensers. Trapped vertical liquid legs running down from the coil outlets are necessary to equalize any difference in coil outlet pressures. These legs should be cross-connected below the receiver.

The difference in pressure at the coil outlets generally results from the use of condensers of different design, unequal size condensers, variations in piping, or variable load conditions. If some precautions are not taken, liquid refrigerant will "back up" into the coil of the condenser having the lowest coil outlet pressure. This will cause a drop in capacity which may result in high head pressure and erratic operation.

The trapped liquid legs allow refrigerant to be backed up into the vertical portion of the pipes, thus balancing the effect of unequal pressure at the coil outlets without backing up liquid into the condensing coil. This type of piping also permits independent operation of any one of the parallel connected condensers.

For standard evaporative condensers, the height of the vertical leg "H" should be a minimum of six feet for Refrigerant 12 or 22, and *three feet* for Ammonia. For other makes of condensers, refer to the manufacturers for pressure drop. For unusual or special applications, B.A.C.'s engineering staff will make recommendations.

The height "H" allows for the pressure drop between the receiver and the point where the equalizing line is tied into the hot gas line. Run the equalizing line from the top of the receiver to the hot gas line and connect it as close to the condenser coil inlets as possible. If, for some reason, the equalizing line cannot be connected close to the coil inlets, then "H" should be increased to compensate for the pressure drop between the hot gas equalizing point and the coil inlets.

Figs. 12B and 12C illustrate alternate piping arrangements for use when it is inconvenient to

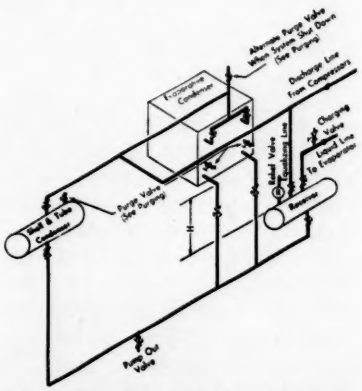


Fig. 13—Case III: Paralleling an evaporative condenser and a shell & tube condenser with one or more compressors.

cross-connect the individual drop legs below the receiver and trap the liquid as shown in the standard arrangement, Fig. 12A.

The alternate arrangement (Fig. 12B) shows the individual drop legs looped under and up into a common horizontal liquid header above the receiver level. This liquid header is then trapped before dropping down into the receiver. In this case, the horizontal liquid

header (instead of the receiver) serves as a liquid reservoir for the drop legs and should be of sufficient size and length to store refrigerant liquid to fill all of the drop legs the required height "H".

If it is inconvenient to loop the drop legs as shown in Fig. 12B, then the alternate piping shown in Fig. 12C may be used. Here the drop legs are tied into the top of the horizontal liquid header. A vertical drum is used at the end of the common header to provide both a trap and a liquid reservoir to fill the vertical drop legs. Storage volume of the vertical drum should be large enough to fill all the drop legs the required height "H", and should be measured through the height marked "X" on Fig. 12C.

In both Figs. 12B and 12C, the high point of the trapped horizontal liquid header is connected to the equalizing line to prevent a siphoning effect from the reservoir to the receiver.

Case III: Connecting And Operating An Evaporative Condenser In Conjuction With A Shell And Tube Condenser

On some existing shell and tube condenser installations, it may be necessary to add an evaporative condenser because of increased water or sewerage costs, ordinances that require the use of some form of water saving equipment, or simply the need for additional capacity. It is usually economical to select the evaporative condenser to handle the normal operating load and use the shell and tube as a "standby" to handle any maximum or peak loads over and above the normal operating load.

When the shell and tube condenser is to be connected in parallel with the evaporative condenser, follow the piping arrangements of Figs. 12A, 12B, or 12C. Substitute the shell and tube condenser for any one of the evaporative condensers shown in these example. Fig. 13 shows the substitution of a shell and tube condenser for one of the evaporative condensers shown in Fig. 12A.

Note: The shell and tube condenser does not require the vertical liquid leg "H", but should be located above the receiver level to maintain liquid flow.

Checking for Non-Condensables

To check the system for non-condensable gases, first close the valve in the liquid line running from the receiver to the evaporator (king valve), then pump down the system slightly, enough to assure that if any non-condensables are present they are pumped over to the high side. Immediately after pump-down, close the discharge valve on the compressor. Operate the evaporative condenser for at least 2 hours or until the water temperature in the sump pan is the same as the entering W.B. temperature. Then the temperature corresponding to the pressure in the evaporative condenser and connecting lines should correspond, or nearly so, to the W.B. temperature of the entering air. If the resultant temperature is higher than the W.B. temperature by more than 2°, the system has an excessive amount of non-condensables. (Be sure that your gauges are accurate when checking for non-condensables.)

Purging the System

If non-condensable gases have been found in the system purge slowly through the ½" connections by the coil outlets. Some non-condensables may be found near the valves at the highest point in the system. Purge here also when the system is shut down. The system may have to be pumped down and purged several times before it is free of non-condensables.

When the system is operating, purge only from the ½" connections at the coil outlets. Each ½" connection should be provided with a valve so that it can be purged separately. If an automatic purger is used, it should be connected to these ½" outlets.

On parallel connected evaporative condenser installations, and on single evaporative condenser installations with two or more circuits connected in parallel, the ½" purge lines may be cross-connected, but only one purge valve should be open at a time.

Caution: Do Not Open Two Or More Cross-connected ½" purge Lines At The Same Time. Opening two valves tied together will equalize the coil outlet pressure and the effect of the vertical drop legs will be lost.

Freeze-Dry New Field

Improved Method Requires Refrigeration For Process

»» FROM all indications, the freeze-dry dehydration method is here to stay. Its advantage in reduced size and weight requirements for transportation and storage has already become of vital importance in the logistics area of military research and will very likely also capture the interest of commercial food processers with an eye to cost reduction. While being forewarned of the elimination of refrigeration requirements in the transport and warehousing areas of the distribution of freeze-dry foods, our readers might well also be interested in the new fields of refrigeration opened up by the increased business offered the refrigeration industry by the equipment required to freeze the food items during the processing stages.

In essence, what will happen with the advent of commercial use of the freeze-dry process, is the shifting of the refrigeration requirement from the distribution phase to the processing phase of the operation.

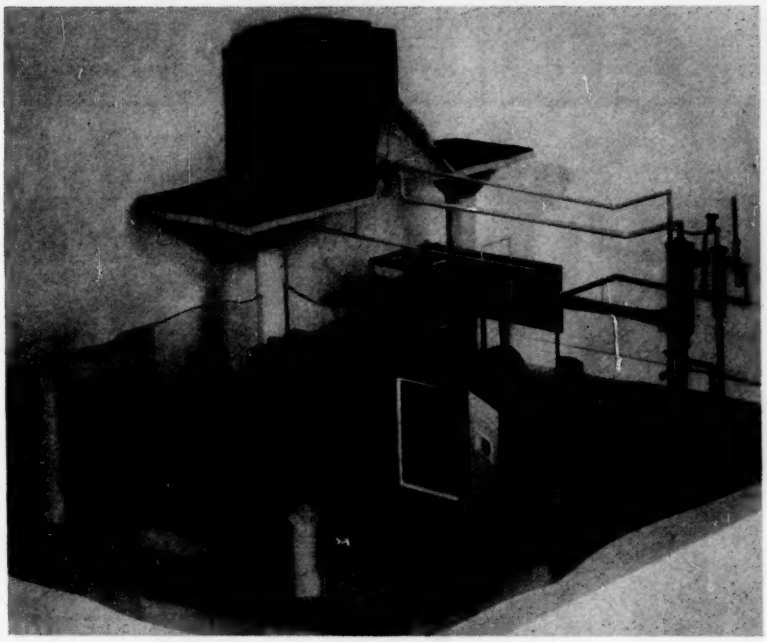
Equipment Must Include Refrigeration

In a discussion with A. N. Lederman, president of Vacudyne Corporation, we learned several facts important to those involved in the refrigeration field, that are worthy of presentation. It appears that the installation, operation, maintenance and supervision of refrigeration components as a part of the freeze-dry processing equipment is vital to the success of the entire program —and here is an entirely new market for our industry to get its teeth into.

He commented that although different manufacturers of the freeze-dry equipment are approaching the refrigeration requirements from different angles, each system bases its freezing action upon heavy duty refrigeration equipment. The large volume commercial processer is

Process Offers For Refrigeration

By M. SCOTT CASSELL



Model of freeze-dry installation at the U. S. Army Quartermaster Corps Food and Container Institute with two dehydration cabinets. This application demonstrates the Vacudyne approach to freeze-dehydration in that the company feels that a multiplicity of small chambers is more beneficial to total production than a single large chamber.

likely to find the same need for complete and adequate freezing components that has been the experience of the research personnel of the U. S. Army Quartermaster Corps—and also to experience the same size and weight reduction savings as have been indicated in the military field that has a tremendous advantage in moving and storing (without refrigeration) of various food items processed in freeze-drying methods.

Costs Affecting Process

Since military logistics and commercial distribution are somewhat comparable, Mr. Lederman pointed out statistics and data made available by the Food and Container Institute of the Armed Forces for the U. S. Army Quartermaster Corps. Research papers published in the Second Quarter QMFCIAF Activities Report contain a discussion by Dr. F. P. Mehrlich, Scientific Director which plainly show the logistic advantages of freeze-drying.

• • •

(Excerpts From)
Economic Outlook for
Freeze Dehydrated Beef
By Ferdinand P. Mehrlich,
Scientific Director QMFCIAF

Quick-serve meals are given that designation because with the addition of hot water, followed by a brief-20-minute-period of "reconstitution" they will be ready to eat. Hence, these meals will be used in conjunction with the individual ready-to-eat meals at the discretion of the doughboy commander.

Freeze dehydration of meat components for the quick-serve meals has a reassuring potential—and it is with respect to this process in particular that we will make further comment.

Dehydrated and radiation-preserved foods would fit into the current concepts for such support area messes. Large tonnages of freeze-dehydrated meats seem certain of consumption under the conditions described. If any uncooked meat items are to be available this is the place for them, and of course, "brown-and-serve" types of meat preparation should not be uncommon.

The foods must be light in weight, durable in composition, attractive in appearance, varied in form, acceptable in flavor and, above all, they must be wholesome.

Cost Governs Process Use

In considering the comparative costs of several processes for supplying beef overseas, we bear in mind that the cost at point of consumption is the meaningful item.

If preparation accomplished heretofore in the field is now done at the packing house or in a related food-processing facility, it is reasonable to believe that the processed product will show a higher unit cost there than heretofore. Offsetting savings in transport, storage, and/or packaging would be desirable, therefore, to keep costs within bounds. Some such savings do seem inherent in the adoption of freeze-dehydrated products. Weight savings amount to as much as 70 per cent; the need for refrigerated transport and storage is eliminated.

Lead to More Convenience Foods

We believe there is in the offing an ever increasing array of convenience foods, which in their way may serve the busy homemaker perhaps even better than instant coffee has served in its particular field.

It seems most likely that in the American economy these new convenience foods will initially supplement and to a degree supplant canned foods. General interest may therefore be attracted to the way in which we envision the possibility of substituting freeze dried meat products for the canned items in combat meals.

Utilize Flexible Package

Calculations made by the Food Division of the Institute indicate that since canned beef and gravy has a moisture content of 61-66 per cent, it follows that 100 pounds of canned meat product having a cube (in the container) of 2.28 cu. ft. should serve approximately 265 men. In comparison, 100 pounds of freeze dehydrated beef (having a cube of 4.88 cu. ft.) would feed 800

Continued on page 25

Coming soon from

NEW! Simple field test for hermetic burnouts

plus

NEW! Easy way to clean out mildly contaminated systems

Full information on these important new developments—plus test kits and pressurized cylinders of "Genetron" 11—will be available from your wholesaler about March 15. See him then!

General Chemical

General Chemical takes the guesswork out of hermetic burnouts

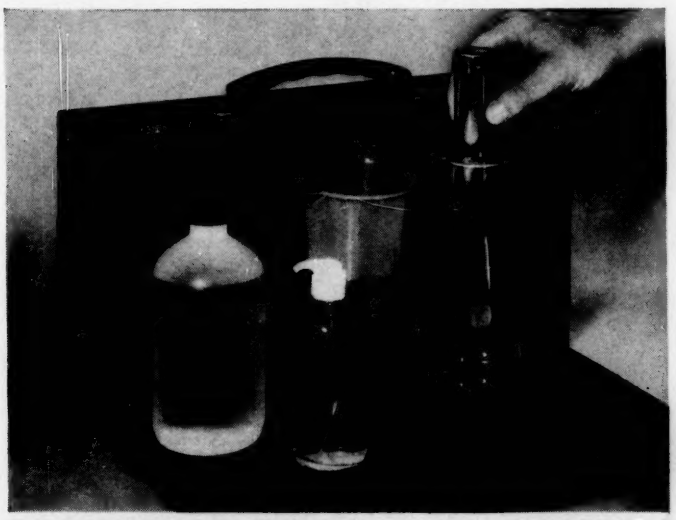
One of the oldest and toughest service problems in the refrigeration and air-conditioning industry has been licked!

Until now, there was no quick, on-the-spot test to determine the degree of acidity in a system after hermetic burnout . . . and there was no easy way to tell when the acid in a system had been cleaned out.

To solve this problem, General Chemical has developed the first simple field test for checking degree of contamination in a burned-out system—before and after cleanout. Yes – we've taken the guesswork out of hermetic burnouts.

In addition, General Chemical has developed an easy, short-cut procedure for cleaning out mildly contaminated systems by using pressurized cylinders of "Genetron" 11 to flush the unit – quickly and without pumping.

See how these new developments can save you time, labor and material costs:



First practical field test method! With this handy, portable kit developed by General Chemical, you can now quickly and easily determine extent of contamination in a system after hermetic burnout. Simple tests show extent of burnout contamination and what clean-up procedure should be used. Also show when cleaning is complete.

New quick, easy way to clean minor burnouts! Mildly contaminated systems can now be flushed and cleaned without pumping by using special new pressurized cylinders of "Genetron" 11 solvent. Prepared especially for flushing burnouts, these pressurized cylinders will soon be available from your wholesaler. An excellent solvent, "Genetron" 11 flushes acids and moisture, loosens and removes solids and is safe to handle.

Here is still another contribution by General Chemical to the advancement of the air conditioning and refrigeration industry. These new procedures will be demonstrated at the International Heating & Air-Conditioning Exposition, Chicago, February 13-16, at "Genetron" Booth #43 . . . and will be shown to RSES and other groups throughout the country in weeks to come.

genetron®
super-dry refrigerants

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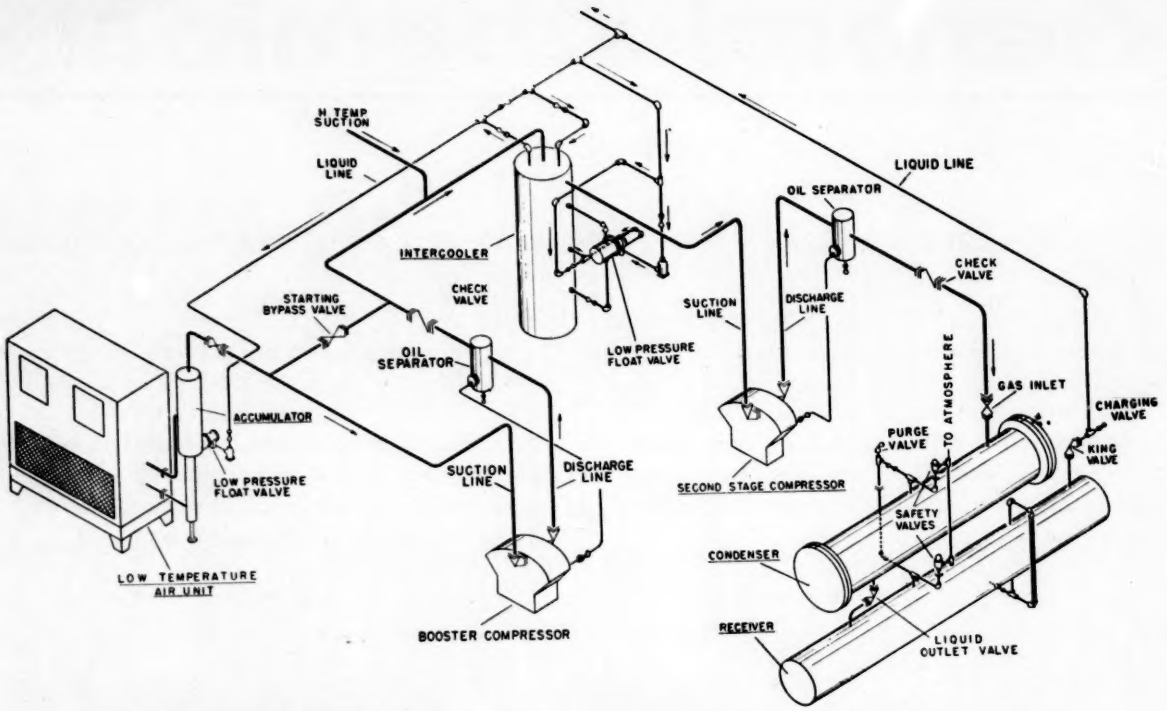

Fig. 1—Typical Ammonia Low Temperature System employing a first stage and second stage compressor.

You can Save Money With Two Stages on Low Temperature

»» YOU MAY be able to do the job with a single stage compressor but if the suction temperature is low enough and the head pressure high enough, that the compression ratio is much above 6:1, your horsepower per ton will be high and so will your operating costs.

That's why The Vilter Manufacturing Company of Milwaukee, Wis., says "You can save with Boosters".

In refrigeration it is not the volume of gas pumped nor the piston displacement of the compressor that determines the amount of cooling performed. Rather, the amount of cooling depends on the weight of the gas condensed and evaporated. If the pressure and, consequently, the gas temperature of the cooling coils is lowered, the volume of a unit weight of refrigerant increases greatly out of proportion to the change of pressure. This is set forth graphically in the portion of Table 1 covering single stage operation.

Note the tremendous increase in horsepower required per ton as the suction pressure, and with it the gas temperature, of a single stage compressor decreases. For instance, lowering the ammonia suction pressure from 20 lb. to 0 lb., at a constant discharge pressure of 175 lb., results in an increase of 85% in hp per ton. This is not efficient operation. As the suction pressure

Power Saving Through Use of Two-Stage Ammonia Compression

OPERATING CONDITIONS		SINGLE STAGE OPERATION		TWO-STAGE OPERATION
Suction Pressure and Temperature	Discharge Pressure	Horse Power* per Ton	Increase in h. p. per Ton (%)	Power Saving (%)
20 Lb. Gauge, + 5.5°F	175 Lb.	1.52	—	11.8
10 Lb. Gauge, — 8.4°F	175 Lb.	1.96	29	13.8
0 Lb. Gauge, —28°F	175 Lb.**	2.81	85	19.0
10" Vacuum, —42°F	175 Lb.**	3.76	147	25.0

*Based upon requirements of 60 ton multi-cylinder compressor.
**These operating conditions are not practical for single-stage operation since compression ratio is above 7:1.

is further decreased, conditions grow steadily worse. At 10" vacuum, 147% more hp per ton is required than at 20 lb. suction.

Now compare this with 2-stage operation.

At 20 lb. suction a saving of 11.-8% in hp per ton can be effected. At a 10" vacuum, the saving in power cost is 25%. Note that power savings increase as the suction pressure decreases.

At 10" vacuum suction and 175 lb. discharge pressure, compressor displacement and horsepower per ton of a single stage compressor are increased well beyond practical limits. In fact, at these conditions, a single stage compressor would require a compression ratio of 19 to 1, a practical impossibility and way above the 7:1 ratio normally recommended as maximum multi-staging makes savings possible since displacement and power requirement increases are not as pronounced. In addition, multi-staging decreases the compression ratio of each compressor.

The use of multi-staging on low temperature applications also results in longer equipment life with less maintenance. At low suction pressures, the temperature of the discharge gas in a single-stage compressor is considerably higher than the temperature of the gas in a multi-stage system. This means that the working parts of the single-stage compressor are hotter and consequently operate under greater stress. Oil breakdown, resulting in poor lubrication and carbonization, is also a constant danger because of the high temperature. Further, if a cold refrigerant slug should get back to the compressor, the sudden contraction of the hot valves might result in breakage. The lower discharge gas temperature in a multi-stage system minimizes these dangers to effect maintenance savings.

Fig. 1 illustrates the most important components of a typical booster or two-stage installation utilizing two compressors.

Note that the suction vapor from the low temperature evaporator passes to the booster compressor where it is compressed to the intermediate pressure before passing to the combination gas intercooler and liquid pre-cooler. This vessel is fitted with a liquid cooling coil and float control for flooded operation. It is designed to remove the booster heat of compression and sub-cool the condensed liquid to approximately the temperature corresponding to the intermediate pressure. The high pressure compressor picks up the cooled gas and compresses it to the plant discharge pressure before passing it through an oil separator to the condenser. After condensation, the liquid flows by gravity to the receiver. From there it passes through the intercooler to the evaporator to repeat the cycle.

The combination gas intercooler and liquid pre-cooler mentioned above accounts for a large part of the savings outlined on the previous page. Cooling the liquid ammonia used in the low temperature evaporator decreases the volume of vapor handled by the booster. Since this cooling is done under the high suction conditions, there is a saving in power. Also, the evap-

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orator is more efficient because there will be less flash gas from cooling the liquid ammonia to the temperature of the liquid in the low temperature evaporator. Cooling the discharge gas from the booster also avoids sending the highly superheated gas into the suction main of the high pressure compressor.

A further advantage can sometimes be gained through the installation of a water intercooler between the compressor stages. The colder the water, the greater the advantage. A water cooler will prove a good investment where the calculated discharge temperature of the booster exceeds the temperature of the cooling water by 40 or more degrees.

A further examination of the drawing will show that a high temperature suction connection is brought into the suction line ahead of the intercooler. This is optional, but is often found to result in savings in operating costs where both low and high temperature loads are encountered as for instance in ice cream plants and cold storage. During the designing of the system, the intermediate pressure is selected to correspond to the higher temperature load.

While Fig. 1 illustrates the use of two separate compressors, the two stages can be obtained in one unit. In a two stage 6 cylinder compressor unit, for example, the outer two banks of cylinders would be used for low pressure or booster cylinders. The gas is pumped to an intercooler and after being cooled, goes to the center bank.

Don't Blame The Compressor

Until You Have Analyzed The Piping and Control System

By Elliott R. Whitman

»» REFRIGERANT consumption of a system is one of the primary methods employed to evaluate the quality of maintenance performed by owners of refrigeration equipment in widely scattered locations. This tool can be useful in other ways. It can be used to check the quality of workmanship on an initial installation, for comparing the quality of work of various contractors, or for comparing the capabilities of workmen performing continuing maintenance on similar equipment. For instance, in surveying refrigerant consumption in a location that had been continually plagued by high consumption, it was noted that one forty horsepower system was using prodigious quantities of Refrigerant-12. The mechanic in charge of the system was questioned and he was sure that it was caused by the brand of the compressor. He stated that he had personally replaced the compressor on three occasions and at each time he had advised the purchasing agent to buy another brand but his advice and knowledge had gone unheeded.

A visit to the machinery room indicated part of the trouble in the suction line. The system consisted of one compressor, an evaporative condenser, and two direct expansion coils, one in the machinery room and the second in a remote location. A glance was sufficient to locate one source of trouble in the piping system. A visit to the remote evaporator indicated still another piping difficulty.

Fig. 1 indicates a schematic diagram of the suction line piping.

The compressor was of a conventional multi-cylinder type having oil actuated unloaders capable of unloading to approximately 30 percent of maximum capacity. The remote evaporator had a normal capacity of 25 tons while the evaporator in the machinery room had a capacity of 15 tons.

In analyzing the suction piping system, lets first look at the evaporator farthest from the compressor. The riser from the coil ran vertically upward about ¾ the height of the coil, then turned to a horizontal line. The short vertical riser had been placed in the line to elevate the horizontal line above structural members of the roof. The horizontal and vertical lines were both 3-⅛ inches in diameter. It was apparent that this line had been sized for a pressure drop equivalent to approximately one degree Fahrenheit. A check on the velocity in the suction line at maximum loads indicated that the refrigerant velocity was 1600 feet per minute. This velocity was satisfactory for returning oil to the compressor under full load conditions. However, when the compressor was operating at its minimum step, the velocity was only 475 feet per minute. This velocity was derived by assuming that both solenoid valves to the evaporators were open at the same time. Thus, the actual load at the 25 ton evaporator was only 8 tons. The 475 feet velocity is not fast enough to raise the oil under partial load conditions.

There are considerable differences of opinion as to what is the minimum acceptable velocity to return oil to a compressor. One manufacturer recommends a minimum velocity of 300 feet per minute while another recommends that it be sized no lower than 1000 feet per minute. The American Society of Refrigeration Engineers recommends between 1000-2000 feet per

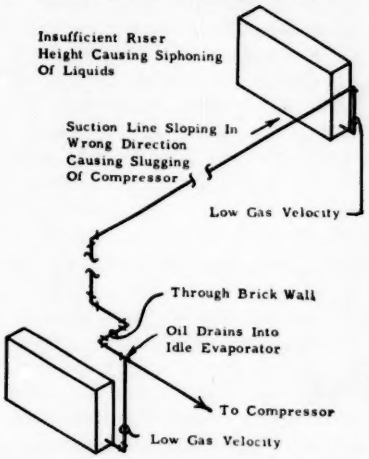

Insufficient Riser Height Causing Siphoning Of Liquids
Suction Line Sloping In Wrong Direction Causing Slugging Of Compressor
Low Gas Velocity
Through Brick Wall
Oil Drains Into Idle Evaporator
To Compressor
Low Gas Velocity

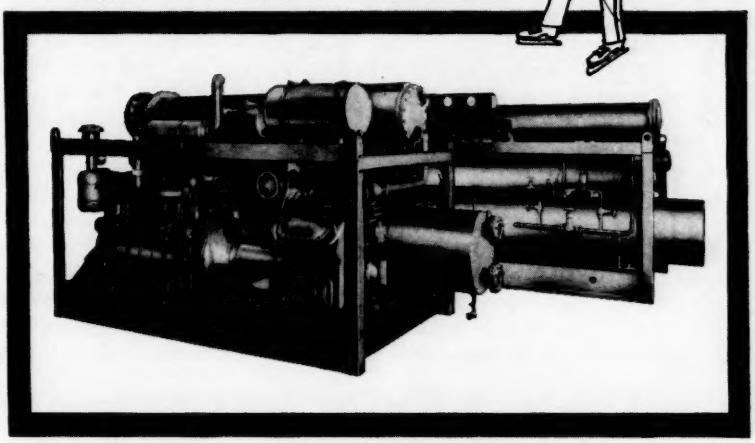
Fig. 1—Piping system and the faults found in it.

minute as being satisfactory. A governmental agency requires a minimum velocity of 2000 feet per minute. The author has never observed a failure that was positively attributed to failure of oil to return at velocities of 1000 feet per minute. Numerous failures have been observed when the velocities have dropped to about 800 feet per minute. The author usually attempts to use a minimum velocity of 1500 feet per minute as it gives a safety factor and at the same time does not cause an excessive pressure drop.

There were two possible solutions to the problem at this evaporator. One involved decreasing the size of the vertical riser to 2⅛ inches where the velocities would be 3800 and 1200 feet per minute respectively at maximum and minimum load conditions. This solution had two possible disadvantages, although neither would have been especially objectionable in this location. One objectionable feature is that the smaller tubing would have caused an increased pressure drop through the system with a decreasing efficiency of the compressor and total capacity at peak loads. The other disadvantage is

Holiday on Ice skates through Africa on Vilter Ice

Holiday on Ice shows, using portable Vilter refrigeration units for building ice surfaces, have been presented in Europe, Middle East, India, Far East, South Africa since 1952.



View showing the two Vilter Ammonia Brine Uni-Chillers shipped in 1960 to Mombasa, Kenya, for Holiday on Ice, Inc.'s latest African tour under State Department sponsorship. The itinerary for the African Show will include Mombasa; Entebbe, Uganda; Dar es Salaam, Tanganyika; and Nairobi.

Last April in Khartoum, Sudan, in 120° temperature, Vilter provided refrigeration for the ice surface of another successful Holiday on Ice Show under State Department auspices.

Since 1952, Holiday on Ice Shows, Inc.'s foreign show units have been using a portable Vilter refrigeration unit for building ice surfaces. In the fall of 1959, this Vilter unit was returned to the United States for rebuilding. According to Mr. A. R. Grant, Business Manager, Holiday on Ice, "We were very much impressed at that time to find that the Vilter equipment required very little work to put it back in top operating condition. It was this experience which led us to select Vilter equipment again for the new 1960 African tour, where we expect to encounter rather extreme conditions."

Two new Vilter refrigeration units were shipped in 1960 to Mombasa, Kenya.

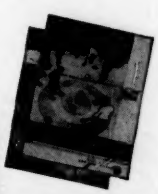
Each Vilter unit consists of a self-contained, fully automatic Ammonia Brine Uni-Chiller, including a 4-cylinder VMC compressor, 16" x 10' condenser, a 20" x 12' chiller, and a Diesel engine.

Each unit is capable of producing 30 tons of refrigeration and together will develop an ice surface of approximately 60' x 100' under any condition.

Vilter equipment has again proven itself as it has in thousands of other installations. Quality design and workmanship pay off in long years of reliable operation—good value for your investment dollar.

Why not see Vilter about your refrigeration or air conditioning application?

Complete ice rink installation engineered by Peter Carver Associates, New York.



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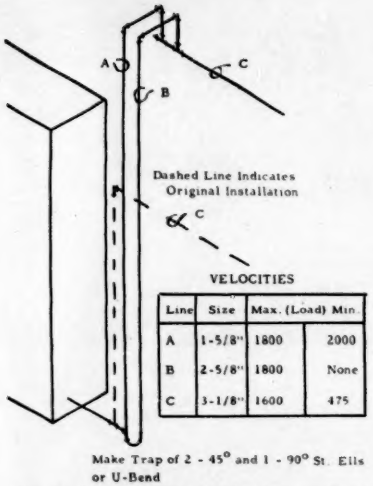

A
B
C
Dashed Line Indicates
Original Installation
C
VELOCITIES
Line | Size | Max. (Load) | Min.
A | 1-5/8" | 1800 | 2000
B | 2-5/8" | 1800 | None
C | 3-1/8" | 1600 | 475
Make Trap of 2 - 45° and 1 - 90° St. Ells
or U-Bend

Fig. 2—Double riser and trap used to insure oil return at all times.

that the high velocity in the small line may have a tendency to create an undesirable whistling noise.

The second solution is to employ a double suction riser. In this application, two vertical lines having the approximate same area as the horizontal run are placed in parallel. One line is selected to have a velocity in excess of the 1000 feet per minute at minimum load conditions while the sum of the areas of the two risers are used to obtain the minimum velocity at maximum load conditions.

Fig. 2 shows how the piping was actually modified on this particular application to assure that oil would return to the compressor. This arrangement is based on the assumption that a small amount of oil would be trapped in the bottom of line labeled "B" and would block off that vertical riser during periods of operation at minimum capacity.

It is interesting to observe that a second improvement was made at this time although the original difficulty was not blamed on this portion of the piping system. It is noted that in the original piping system, the vertical suction riser turned directly upward. In the revised piping system a place was provided for oil to drain. Most manufacturers of direct expansion valves recommend that a trap be provided to drain any excess oil leaving the evaporator. Unless this drainage is provided the remote bulb may respond to the temperature of oil trapped in the horizontal run instead of the temperature of the suction gas. As the oil takes considerably longer to change temperature than gas, it was entirely possible that the slow response could have permitted slugs of liquid refrigerant to return to the compressor.

The suction line was raised above the evaporator to prevent siphoning of liquid, back to the compressor.

Similar difficulties were apparent on the evaporator in the machinery room. However, in addition to the problem of siphoning and low suction gas velocity, an additional one of greater magnitude was also observed. The fan-coil unit served a suite of interior offices and was not operated except in the hottest weather. The remote evaporator served an area having a considerable amount of electronic equipment that required air conditioning throughout the winter months. Consequently, oil from the remote evaporator was draining into this coil instead of returning to the compressor when this evaporator was inactive. This amounted to considerable quantities as the remote evaporator ran for long hours during the winter months while the other evaporator was inactive. The inverted trap in the line also serves to prevent oil from draining into the inactive evaporator. Consequently, the solution was double suction risers with an inverted trap.

It is interesting to note that all failures occurred during periods of extremely light loads or immediately following these light loads. In one particular instance additional oil had been added during the winter. Failure occurred immediately after the office personnel had turned on their air conditioning during an extremely hot day in the spring. It can be almost positively concluded that this failure occurred when a large slug of oil from the evaporator entered the compressor or that the compressor crankcase overfilled with oil causing the failure. In either case, poor piping was the cause.

This was how the suction piping system was analyzed by observation and deduction. However, during the process of modification of

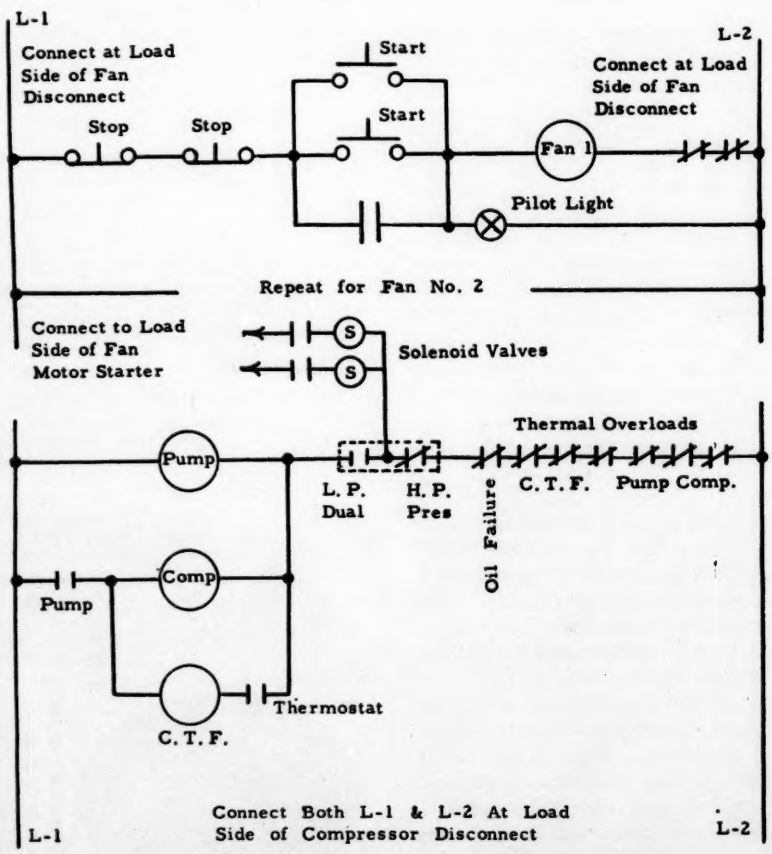


Fig. 3—The control system used to provide needed safeguards.

piping, an argument developed as to the amount of slope in the long horizontal line leading from the evaporator farthest from the compressor. Several guesses were made as to the actual slope. These estimates varied from level to more than 1-½ inches every ten feet. A small bet was finally made as to who had made the best estimate and a level was placed on the line. To the amazement of all, the line sloped in the opposite direction from that of refrigerant flow. This incorrect slope could and probably did cause severe oil slugging of the compressor. It is most important to check and evaluate each portion of a suction piping system when difficulty is experienced with oil return, and slugging of compressors with either oil or refrigerant. It is interesting to note, after the level indicated that piping system to be incorrectly sloped, that everyone had been using a nearby structural truss as a horizontal plane. However, the truss had been fabricated with camber to carry considerably more load than the roof, and was not level. The only way that slope can be correctly determined is by means of a level. In all probability, the mechanic making the original installation had also used the cambered roof truss as a horizontal plane to guess at the slope on the suction piping.

Correction of the suction piping system was only a part of the deficiencies that were involved. The mechanic performing maintenance on the system was aware that the problem involved oil failure and had made several attempts to get an oil failure cutout installed on the system. However, the policy of management was to the effect that mechanics were to replace only defective items and modifications were not permitted. The mechanic had managed to obtain the necessary safety switch but could not get it installed because of difficulties in securing electrical materials. Consequently, for a few dollars worth of materials, several thousand dollars had been spent over a prolonged period for replacement compressors.

Further investigation indicated many more difficulties in the power and control system that could have caused compressor failure.

Each zone was controlled by a two position thermostat that opened and closed a solenoid valve to the evaporator. Fan operation for each zone was controlled by disconnect switches located in the machinery room. The machinery room was accessible only from an outside door which required walking one way approximately 150 feet from the closest zone and 250 feet from the farthest zone. A disconnect switch was in the second zone near the fan-coil unit in compliance with the National Electric Code but to reach it required climbing a ladder some twenty feet, and walking a narrow catwalk some seventy feet. Needless to say this switch was not used. The prevailing practice in starting and stopping each system was to send the newest employee back to the machinery room to turn on or off the air conditioning equipment. At one time each disconnect switch had been labeled, "Turn on first—turn off last, etc." All of these paper stickers had fallen off several years before. A thorough check of the entire wiring system indicated the following deficiencies.

a. One of the solenoid valves would operate whether or not the fan was operating.

b. Both solenoid valves would open when the compressor disconnect switch was open.

c. Both solenoid valves would open when the high head pressure cut-out was open.

d. The compressor would operate whether or not the condenser water pump was operating.

e. Provisions had not been made to control the temperature or quantity of cooling water to the condensers. During some days, insufficient pressure had been available across the direct expansion valve to secure proper operation.

f. The compressor was operating on a single pump out circuit without crankcase heaters while the compressor manufacturer recommended a continuous pump down circuit. It was apparent that the system would need to be completely rewired to correct these deficiencies. The wiring diagram in Fig. 3 was proposed and installed.

This wiring system has the following features.

a. It permitted starting and stopping of either system from the conditioned area or in the machinery room. This allowed the machinery room to be locked against unqualified men.

b. It prevented the opening of solenoid valves except when compressor was able to operate.

c. It assured proper sequence of operation of all accessory equipment.

The identical brand of compressor has been in continuous operation some two years without any serious malfunction. The particular mechanic operating and maintaining the system will now admit that he misjudged the quality of the particular brand that he once so violently disliked.

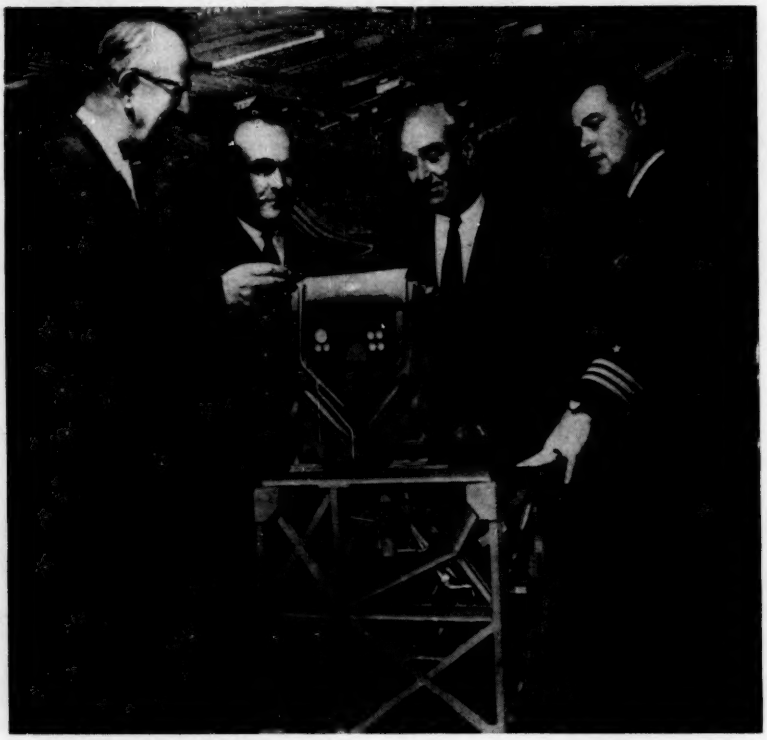
Frozen Food Packers Release Convention Program

»» THE National Association of Frozen Food Packers announced their program for their 20th Annual Convention and Exposition. The convention will be held in Dallas, Texas, March 5-8, 1961. In announcing the program, Ansley Watson, 1961 Convention Committee Chairman, stated that 5 outstanding events will highlight the entire affair.

On Monday morning, the opening general session will feature Dr. G. Herbert True, the noted writer, lecturer, and creativity consultant who will address the delegates on "Creative Management 1965."

One of the most interesting and thought-provoking sessions ever planned by the NAFFP will take place on Tuesday morning when seven top frozen food buyers will form a panel to discuss the mutual problems and opportunities encountered in this area of sales. The panel has promised to offer a lot of suggestions for every segment of the industry. Represented on the panel will be Alan Young, Safeway Stores, Inc., John MacNeil, First National Stores, Inc., A. "Scotty" Wilson, Jewel Tea Co., Inc., David Silverberg, Wakefern Food Corp., Lloyd M. Johnson, Super Valu Stores, Inc., E. J. Voigt, Loblaw, Inc., and Murray Yunker, Certified Grocers of Calif., Ltd.

Model of Water Chiller For Submarine Service



Naval officers inspect a model of the new heat-operated water chilling machines Carrier Corporation is building at Syracuse, N. Y., for nuclear-powered submarines. The cooler has few moving parts to make noise, uses plain water as its refrigerant and is energized by steam from the sub's atomic reactor. John F. Kooistra, (left) Carrier sales manager for large equipment, explains the unit's refrigeration cycle to (left to right): Cmdr. T. M. Johnston, inspector of material, Syracuse; Vice Adm. R. H. Rice (ret.) now affiliated with Research Corporation at Syracuse University and Cmdr. T. R. Rhees, on the staff of Vice Adm. William F. Raborn.

NARW's Annual Meeting To Have Broad Program

››› THE business program for NARW's 70th annual meeting in San Francisco, March 26-30 will cover an unusually wide range of subjects both operational and technical.

Now being planned are panel sessions and speakers covering office mechanization possibilities for refrigerated warehouses, new developments in fire and legal liability insurance, dock operations including truck precooling methods and procedures for taking product temperatures, voluntary frozen food handling practices and the research facts behind them and automation in public refrigerated warehouses present and future.

In other sessions labor attorneys will discuss contract negotiations, what to do when the union comes, what happens under arbitration and office unionizing attempts; CPA's will analyze the results of the first year's operation under a new cost system by a group of west coast warehouses, and members will hear a report on the basic research findings which will be the basis of NARW's long range plan for association services and activities.

In addition, two half day sessions will be given over to The Refrigeration Research Foundation for technical subjects, including a tour of USDA's Western Regional Research Laboratory at Albany, Calif.

A brand new feature will be the availability of the TRRF Scientific Advisory Council for personal discussion on individual problems.

Other subjects expected to be covered include truck detention, interstate income taxes, and containerization.

Exhibits by NARW associate members and a social program for both the delegates and their wives will complete the program.

Convention headquarters will be in the Mark Hopkins Hotel.

How Rough Are Packages Handled During Shipment?

››› HOW rough are packages handled in shipment? This is a question frequently in the minds of both individual and commercial shippers, particularly during the Christmas period when shipping facilities are clogged with a multitude of packages of varying size and value.

The Air Force has attempted to answer this question for its own information, and its conclusions are reported in a publication now available to industry and the public through the Office of Technical Services, Business and Defense Services, Administration, U. S. Department of Commerce, Washington, D. C. The measure for determining the degree of rough handling used in this survey is the maximum distance a package is dropped during shipment. The Air Force study results in a rule-of-thumb estimate that packages of the size used in the test will not be dropped more than 29 inches. This conclusion is based on a scientific recording of drops of a group of cleated and banded plywood containers, measuring 19 inches square, on 49 cross-country shipments by air, rail, and truck, from Wright-Patterson Air Force Base, Ohio, as far east as New York, as far west as California, and as far south as Texas.

Using the results of these shipments as a guide, the Air Force considers a test drop of 21 inches adequate for measuring the ability of packages of this size and construction to withstand the rigors of actual shipping conditions.

To insure scientific accuracy, the Air Force used shock-sensitive recording instruments concealed inside ordinary looking plywood containers. Personnel handling the test containers tossed them about as they would any other item, unaware that each bump, jolt, and

drop was being registered by calibrated styli on wax coated paper fed from a roll inside each container.

During the study some test packages were inadvertently marked "Fragile, Handle With Care." However, the shock recording instruments indicated that these packages were not necessarily handled more carefully, so this mismarking did not invalidate the study. But in fairness to the package handlers, the report emphasizes that the similar shock figures obtained for fragile as well as unmarked packages are based on packages making only 11 out of the 49 test trips. So it is anyone's guess whether or not it pays to mark a package "fragile."

Comparative data collected from packages making air, rail and truck transit show no trend which would indicate one type carrier handles packages more carefully than the others.

The major conclusion of the study, according to the report, is that accurate measurement of shock environment and estimation of probable average and maximum safe test drop heights is not only possible but feasible. Using commercially available shock recording instruments costing less than $200, the Air Force established the recommended test drop heights for its shipping containers.

The report points out that only drop tests representative of the shipping environment are effective indicators that a shipment is properly packaged for safe transit. One reason the survey was conducted is the fact that drop test heights are often arbitrarily set and are not representative of the shipping environment. Because of shortcomings of the shock recording equipment and the limited scope of the study, the data gathered is not considered sufficient to assure the accuracy of all reported test drop heights, but the data does show the frequency and distribution of significant shocks incurred by a particular type of container during normal shipping and points the way to test drop standards.

Shock probability graphs compiled from data obtained in the study indicate that there is less than a one percent chance of the average test package being dropped more than 29 inches at any one time during shipping. Only eight out of 1,000 drops were greater than 29 inches. The report of the survey includes percentage figures of drop probability for other heights and discusses problems associated with shock damage prevention. The shock recording instrument used is described and installation, calibration and recording techniques are explained. Data collected are analyzed and presented in graphs. The report is Measuring Field Handling And Transportation Conditions. K. W. Bull, Capt., USAF, and Dr. C. F. Kossack, Purdue University, for Wright Air Development Division, U. S. Air Force. Feb. 1960. 39 pages. (Order PB 161 918 from OTS, U. S. Department of Commerce, Washington 25, D. C., price $1.)

Freeze-Dry Process—Continued

men. The addition of a dehydrated gravy base if needed to make this comparison more acceptable, would not in our estimation greatly alter either the weight or cube of the dehydrated meat. Hence, the logistic advantages of dehydration are at once apparent.

Reduction in weight and in cube per serving not only has the appropriate logistical implication but is the basis on which transportational savings rest.

It looks therefore as if freeze dried meat products of superior quality, compared to canned meat items, can be supplied to world areas at little if any additional cost over the cost of currently used items.

• • •

Then, adding some cost information of his own, Mr. Lederman pointed out that cost per pound in the freeze-dry process must be based on the cost of the item, the cost of distribution and the cost of the processing and processing equipment (amortization and maintenance).

"There is every indication that water can be removed in a commercial freeze dehydrator for less than 2 cents per pound.

The Vacudyne Corporation President listed the major parts of a freeze-dry commercial installation —as engineered by his company— as being (1) blast freezing equipment (2) drying chamber(s), (3) vacuum producing system (Refrigeration and vapor condenser or steam jet), (4) heat source, (5) cooling source (usually a single-stage Refrigerant -22 system at -30°F or multi-stage system at -40°F or lower), (6) product trays and (7) product handling equipment.

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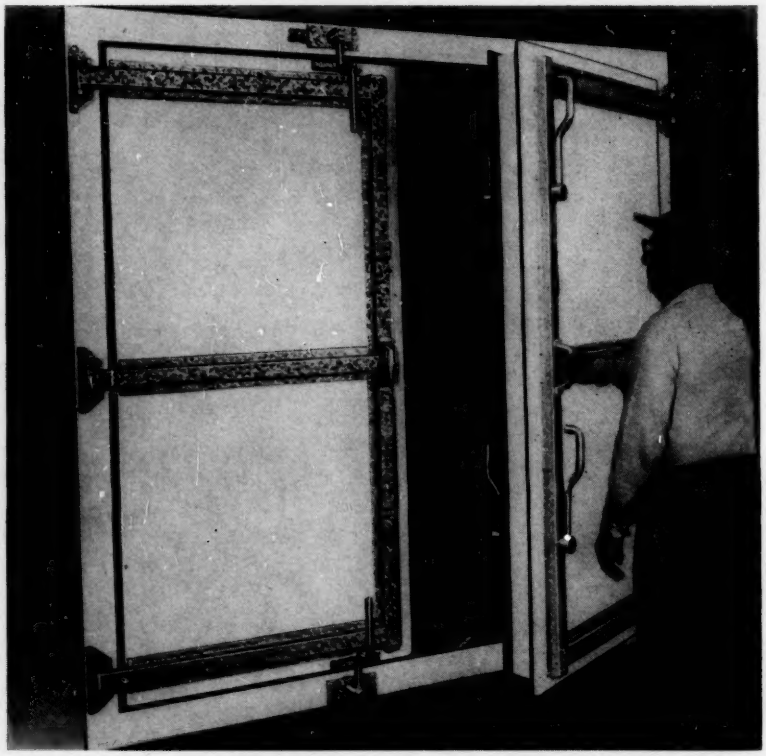
New Cargo Reefer Doors Improve Insulation, Reduce Weight 3/4 Ton Per Opening



»» WEIGHT savings of 1500 pounds per cold storage doorway are provided by new plastic cargo reefer doors manufactured by the Jamison Cold Storage Door Co., Hagerstown, Md. Weight of the new doors is less than 25 percent that of conventional metal clad reefer doors. The new doors provide an average 12,000-pound weight reduction for typical reefer ships.

The doors are designed for minimum weight and improved insulation without sacrificing strength. Heavy-gage galvanized sheet steel baffles on outside of doors protect against damage by cargo. The heavy duty baffle bars are secured firmly to the doors and insulated to prevent heat conduction. The baffle bars also serve as braces increasing the doors' rigidity. Heavy metal also protects areas of jamb abuse.

Thru rods and door sill edges are built with a new thermal break construction to prevent heat conduction and minimize condensation and frost on exposed metal parts. Compression and sweeper gaskets along door edges prevent cold air leaks and reduce heat loss. Each leaf is fastened securely by two fastener dogs. All thru rods have thermal breaks.

Light weight makes the doors handle easily and prevents injuries to personnel from swinging doors during loading and unloading. Strong, lightweight plastic construction of the new reefer doors is the same principle used in Jamison doors for ship stores. Outer shell of the doors is fiberglas-reinforced polyester plastic, the same material used in fiberglas boat hulls and car bodies. The fire-resistant, impervious material possesses rigidity plus a slight resilience that improves its resistance to impact damage. The door incorporates materials and ratproof design with U.S.P.H. approval for shipboard use.

Foamed-in-place polyurethane plastic inside the doors has twice the insulating value of conventional insulating material. The foamed plastic is 5" thick for thorough protection. Foamed in place inside the door shell, it fills all voids and bonds tightly to all inner surfaces, making the door a strong unit.

ASHRAE To Close Its Laboratory In Cleveland

»» FOLLOWING serious study and long consideration, the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) has decided to continue research through an expanded grants-in-aid program to colleges and private laboratories and to close its Laboratory in Cleveland, Ohio.

This action, voted upon at a recent meeting of the Board of Directors in Chicago, followed the recommendations of the Society's Long Range Planning Committee. which had carefully analyzed ASHRAE's research activities for six months.

In announcing this decision, Walter A. Grant, president, stated: "The Society will, in future, greatly expand its program of research grants and cooperative and sponsored contracts to replace the program at Cleveland which has comprised, by far, the largest portion of our research activity in the past." He outlined five recommendations of the Long Range Planning Committee, designed to assure a research program geared to meet the Society's future needs, to fulfill more adequately ASHRAE's responsibilities to the public and to respond to the varied interests of the Society's more than 18,000 members. These recommendations are:

1. Continue a vigorous research program.
2. Discontinue the Society's Laboratory at Cleveland and dispose of it as soon as is practicable.
3. Conduct and sponsor research at universities and other established laboratories.
4. Use Society general funds for Society administration of the research program and the publication of research.
5. Use a Society Research Fund to finance research work through grants to universities and contracts with private laboratories.

ASHRAE and its predecessor societies have conducted research programs since 1917, contributing outstanding achievements in the fields of heating, refrigerating, ventilating and air-conditioning.

Temperature Recording Control

A RECORDING impulse-type thermostatic control designed to bring the advantages of modulating control to electrical heating equipment has been announced by the Partlow Corporation and designated Model RES.

This proportioning recorder-controller is designed for use where process temperatures are critical and overshoot (or undershoot) cannot be tolerated. It also is recommended for applications where the capacity of the electrical heating elements is large in relation to the work load, risking serious overshoot with conventional two-position control.

The Model RES provides variable electric input to the controlled equipment so that changes in temperature within the modulating range automatically produce proportional changes in heat input. Current is supplied in timed impulses by means of a constantly rotating cam which cycles a snap-acting switch in the control circuit.

ASHRAE Technical Sessions February 13-16 To Discuss Variety of Subjects

»» SIGNIFICANT technical sessions and the installation of new officers will be the star attractions at the Semiannual Meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE), February 13-16, 1961 in Chicago. All meetings will be at the Conrad Hilton Hotel.

During this same period, the 15th International Heating And Air-Conditioning Exposition, sponsored by ASHRAE, will be held at the International Amphitheatre. Reservations for exhibit space have reached a new high and the Exposition should provide an unusual focus for interest and attention upon the activities of manufacturers and their products.

The new officers to be installed at the Banquet on Tuesday evening, February 14, are R. H. Tull, who will succeed Walter A. Grant as president; John Everetts, Jr., who will become first vice president. It is anticipated that John H. Fox, nominee, will be installed as second vice president and that John E. Dube, current treasurer and nominee will serve a second term.

There will be four technical sessions during which 16 formally prepared papers will be presented upon various topics in groups under the headings of combustion, insulation, refrigeration and general. Symposiums will total six, as will forums. Topics for the first of these less formal occasions have been embodied under the headings of Frozen Food Handling, Medium Temperature Water Heating, Air Conditioning, ASHRAE Research Plans and Programs, Domestic Refrigeration and Ventilation. Forums, which are completely off-the-record gatherings, will review Transport Refrigeration, the proposed new Psychrometric Chart, Better Environments for Learning, Corrosion of Air Conditioner Components, Aluminum Brazing and Welding Techniques and the status of Thermoelectric Refrigeration.

Social events will include the

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Welcome Luncheon on Monday, February 13, the Banquet on Tuesday, and side trips to such points as the Argonne Laboratory and the Dresden Nuclear Power Station, powered by a 180,000-kilowatt General Electric boiling water reactor.

First Shipment of Liquid Neon

»» THE Linde Co.'s Town of Tonawanda plant has chalked up another "first" in the missile and space field with the first commercial shipment in history of liquid neon.

The liquid neon was shipped to the Radio Corp. of America, Lancaster, Pa., for use in airborne radiometers, which are infra-red detection devices requiring supercooling for maximum effectiveness. The refrigerant must be so cold for this use that its boiling point has to be around -400 degrees Fahrenheit.

The liquid neon shipped by Linde boils at minus 410.8 degrees.

The shipment was made in a special 96-pound container, with the liquid neon shielded by a layer of high-vacuum laminated insulation and 13 liters (about 13 quarts) of liquid nitrogen in two concentric outer shells.

The shipment, consisting of ten liters of liquid neon valued at about $250 a quart, was handled by the Tonawanda engineering Laboratory. The liquid neon also was made here by Linde.

Linde said the shipment, made possible by advances here in low-temperature technology, may be the forerunner of an important new market.

Dairy Management Course Sessions Scheduled

»» THE spring sessions of the Management Development Course for Dairy Executives will be repeated at the Granville Inn, Granville, Ohio, during the week starting Sunday, February 19, to Saturday, February 25. Both the first and second sessions will be conducted concurrently with participation limited to 25 men in each class. The Granville Inn was the location of the fall session in 1959 and hosted a successful program during the period November 13-19, 1960.

Since its development in the spring of 1959, one hundred and seven dairy executives have completed the first half of the program, and forty-two dairymen hold certificates acknowledging completion of the two weeks of training.

Dr. Earl Strong, Educational Consultant to the International Association of Ice Cream Manufacturers, heads the faculty. He is Professor of Management and Assistant Dean of the College of Business Administration and Director of the six-week Executive Development Course at Penn State. Dr. Strong has gathered a group of instructors who have been successful in both academic and business careers. Returning as instructors are:

Dr. James H. Healey, Director, Management and Business Services, Columbus, Ohio

Dr. Michael J. Jucius, Professor of Business Organization, Ohio State University, Columbus, Ohio

Dr. G. Kenneth Nelson, Professor of Accounting, The Pennsylvania State University, University Park, Pennsylvania

Dr. Arthur R. Upgren, Professor of Economics, Macalester College, St. Paul, Minnesota

Dr. Edward Barnet, Professor of Business Administration and Director of Programs in Mass Marketing Management and Food Distribution Administration at Michigan State University, will join the faculty for the first time to handle the presentation on "Productivity, Survival, and Growth" for the second session.

The Management Development Course, organized and conducted by the Ice Cream Merchandising Institute, an affiliate of the International Association of Ice Cream Manufacturers, is co-sponsored by: The American Dry Milk Institute, Dairy Industries Supply Association, Milk Industry Foundation, and the Ohio Dairy Products Association.

Anyone interested in enrolling personnel in the Course or to obtain additional information should contact the Ice Cream Merchandising Institute, 1105 Barr Building, Washington 6, D. C.

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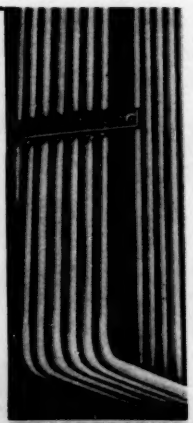

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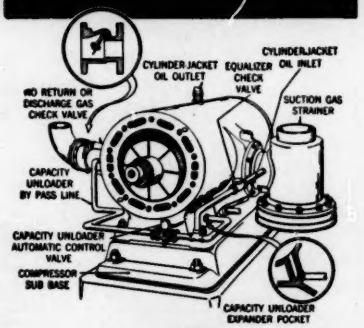
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FFAICC Reports Committee Progress

››› THE quality and environmental control program of the Frozen Foods All-Industry Coordinating Committee is making substantial progress and is fully on schedule, according to plans formulated last June in Dallas.

The Sub-Committee, headed by Richard Powell of NARW will complete its work on the voluntary industry standards of practice at a meeting in Washington on January 17. Thereafter a meeting of the entire FFAICC is planned to follow in about two weeks to consider recommendations of the subcommittee and finalize the standards.

It is hoped then that a meeting of two small task groups from FFAICC and AFDOUS respectively, as suggested by A. E. Abrahamson of New York City, on November 5, can meet during February to bring the objectives of the two groups into realistic and harmonious focus. Fred Otterbein of Birds-Eye will head the FFAICC Task Group.

The education and information sub-committee of FFAICC, headed by Dr. Milton Ratner of ATA and Harry Schauffler of NFFA, met in Chicago on December 10th, with the chairman of FFAICC, Dr. H. C. Diehl, and developed further plans for industrial training seminars and other media for transmitting essential information on frozen food handling throughout all segments of the industry. Two motion pictures are in the planning or production stage, one by ATA primarily intended for refrigerated truck drivers and one by USDA's motion picture unit to cover the subject of frozen food quality and protection more generally.

The chairman of FFAICC, Dr. H. C. Diehl, has continued and will continue his visits to the state committees, so that by the summer of 1961, all States will have the committees organized and the members informed about their responsibilities. By mid February, the chairman will have made contact with State Committees in half the States of the Union. Much interest in and enthusiasm for the FFAICC program is being expressed by members of these State committees, which are so essential as media to explain the objectives of the program to the "grass-roots" personnel of the industry.

Dr. Diehl recently stated that he is very pleased by the earnest and sustained efforts of all concerned with this unique voluntary program and with the progress made during the six months of the committees existence. He is gratified also by the constructive reaction of the AFDOUS leadership to the industry's and FFAICC's accomplishments to date.

Certainly the FFAICC can report significant and even astonishing progress in its self-control program at the AFDOUS Annual Convention in Washington during early June.

Frozen Food "Reefer" To Solve Problem Of Low Temperatures

››› A SOLUTION to the problem of maintaining below zero temperatures of frozen foods in transport, which concerns the great frozen food industry and State food regulatory bodies, will be offered soon by E. F. Ryan, president, Rail-Trailer Co., Chicago.

"After long experimentation we have been able to develop a trailer specifically for the transport of frozen foods, with an entirely new refrigeration system and so insulated that it will hold -10° to -20°F. for at least five days", said Mr. Ryan.

Also, equally as important as the new 40' Rail-Trailer "reefer" (refrigeration truck trailer) will be to the frozen food industry and to carriers, is the fact that the same method of insulating the new trailers can be used to modernize existing refrigerator trailers which will not now hold the low temperatures for as long as is necessary.

"Application of the new insulation to some 80,000 existing "reefers" can be a boon to the trucking and the frozen food industries", says Mr. Ryan, for they cost approximately $12,000 each and many are too new either to trade-in or to junk.

In late January of 1961, Rail-Trailer Co., pioneer of the system

MODERN NIAGARA CONDENSERS PAY FOR THEMSELVES IN EXTRA SAVINGS

These Niagara condensers are lower in first cost and assure you of trouble-free automatic refrigeration. Special features: "Aeropass" coil removes super-heat to give you condensing at lower temperatures and prevent loss of capacity by the scaling of condenser tubes; "Oil-out", oil separator between pre-cooling and condensing coils gives you always an oil-free system; "Panel-Casing" construction gives you access to every part of the condenser for inspection and maintenance. Operating engineers say these condensers "save half the work of running a refrigerating plant". Managers who know costs and profits prove that Niagara condensers bring them great returns in power savings, water savings and reduced maintenance expense.

Write for Bulletins 131 and 142.

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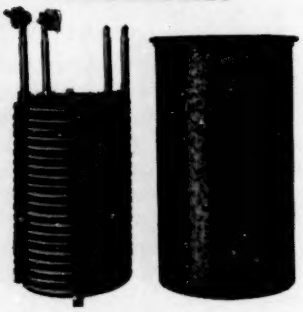

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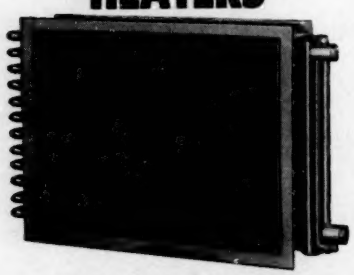

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of transporting truck trailers on railroad flatcars, lessor of trailers, flatcars and other "piggy-back" equipment and operator of loading and unloading terminals, will hold a meeting in Chicago to present its new frozen food reefer and the new method of insulating to members of the frozen food industry, motor carriers, railroads and others.

American-Standard Exhibit at Heating & AC Show

››› BUILT around the central theme of Air-Lift for commercial and industrial buildings, the American-Standard Industrial Division booth (Nos. 20 and 22) at the 15th International Heating & Air Conditioning Exposition will stress single-source responsibility in air conditioning systems. The Exposition will be held in Chicago's International Amphitheatre, February 13 through 16, 1961.

The display will be the largest exhibit ever produced by the Industrial Division. The nearly 2500 sq. ft. booth space will feature a plastic model of a typical public building which will glow in alternating colors to depict the changing seasons and the consequent need for year-around air conditioning. A broadcast message at this location will inform the visitor of what is to be seen throughout the exhibit.

Individual displays will be shown "gallery" style in casual, uncluttered settings, which are to feature a minimum of printed copy to be read. Each exhibit will be provided with a "listening post" where the visitor can, if he chooses, hear a recorded message describing the equipment.

The booth design has been created with the express purpose of providing a relaxed atmosphere in which the visitor will find it easier and pleasanter to secure additional information on equipment in which he is particularly interested. The open, uncluttered arrangement permits him to take in at a glance the full range of equipment available from this single source for complete air conditioning systems. The listening post technique eliminates the need for what often proves to be cluttered and distracting descriptive product copy.

Pennsalt To Exhibit New, Low Temperature Refrigerant

››› PENNSALT Chemicals will feature a new member of its line of refrigerants and a new container for one of its standard products at the 15th International Heating and Air-Conditioning Exposition in Chicago from February 13 through 16. In addition to these new developments, Pennsalt will also feature the five members of its present Isotron refrigerant line.

Isotron 13, introduced to the trade in 1960, is designed especially for use in producing temperatures below -100°F. It will be particularly useful in providing low temperature atmospheres for research and development in the aircraft, missile, chemical, automotive and petroleum fields.

The new container, to be shown for the first time at the Heating and Air-Conditioning Exposition, is a disposable aluminum Handi-Can for Isotron 22. The new can will provide the air-conditioning and refrigeration serviceman with a more convenient, light-weight charging can.

Pennsalt, an exhibitor at the show for several years, will be represented by sales and technical personnel from both the Isotron Sales Department and from the company's Research Laboratories.

Honeywell, Overend, Geraghty To B.A.C. Sales Posts

››› WILLIAM E. Kahlert, vice president in charge of sales at Baltimore Aircoil Company, Inc., has announced the appointments of James O. Honeywell and John W. ("Chick") Overend as assistant sales managers, and Patrick J. Geraghty, Jr. as sales engineer. These three appointments are another step forward in the expansion of B.A.C.'s sales force.

Honeywell is a graduate of the United States Naval Academy and served five years active sea duty before joining B.A.C. in 1957. For the past three years he has served as sales engineer and is an ASHRAE member.

Overend, who recently joined B.A.C., comes well qualified for his new position. Following his

Left to right: J. W. Overend, J. O. Honeywell and P. J. Geraghty Jr.

graduation from Carnegie Institute of Technology, Overend served four years as sales engineer for A. M. Byers Co., three years as an engineering specialist for the U. S. Navy during World War II, eight years as district sales manager for Superior Valve and Fittings Co., and four years as assistant sales manager in air conditioning at Koppers Co., Baltimore.

Geraghty, who has also recently joined B.A.C., is a graduate of Colgate University. For the past five years he has been a sales-service representative for Kaiser-Aluminum and Chemical Corporation.

Fritts Gets New Post At Aluminum of America

››› ALUMINUM Company of America recently announced the appointment of Harry W. Fritts as development manager, containers and packaging, a new position in the company's development division.

The move follows an expansion of Alcoa's sales development division, and its reorganization along industry lines.

Formerly manager of the packaging section, Mr. Fritts now directs the activities of a group charged with developing and advancing aluminum uses in packaging meat and dairy products, dehydrated foods, tobacco, drugs, baked goods, condiments, frozen foods, confectioneries, beverages, non-food products, and military items. A graduate of Columbia University, he has been with Alcoa since 1948.

E. J. Kocher Named Director of Vilter Manufacturing

››› ERICH J. Kocher, chief engineer of The Vilter Manufacturing Company, has been elected a director of the Milwaukee manufacturer of industrial refrigeration and air conditioning equipment.

Mr. Kocher joined Vilter in 1937 and has served in both manufacturing and engineering capacities before being named chief engineer in 1945. He is responsible for the development of a considerable number of patents, all of which he has assigned to The Vilter Manufacturing Company.

A graduate of Marquette University, Mr. Kocher is a member of the American Society of Heating, Refrigerating and Air Conditioning Engineers and the American Society of Mechanical Engineers.

Truck Refrigeration Catalog

››› KOLD-HOLD Hold-Over plates, Crest condensing units (for "nose" mounting or "skirt" mounting) and a complete line of accessories are presented in the new Catalog No. K-61, now available from the Kold-Hold Division of Tranter Manufacturing, Inc., Lansing, Mich.

The new, fully illustrated catalog describes product construction and operational features. It also provides complete engineering data for the proper selection, installation and use of truck refrigeration equipment.

Accessory items include "package" expansion valve-drier-heat-exchanger-moisture indicator console panels. Also included are mounting brackets, gauges, thermometers, liquid and moisture indicators, make-and-break connections, expansion valves and other truck refrigeration system accessories.

The catalog also introduces a new truck body heater. For your copy of this illustrated catalog write the company and ask for the new Catalog No. K-61.

Brochure Introduces Air Compressors

››› NEW illustrated Bulletin 203, just issued by Clark Bros. Co., Division of Dresser Industries, Inc. introduces the Clark C-Line of packaged air compressors for industrial applications. The line includes four models rated at 25, 50, 75 and 100 hp respectively.

Fully described and illustrated are all important features including compact, W-Type design, two-stage compression, air cooling, high efficiency compressor cylinders, rugged auto-plate valves, heavy duty crankcase and running gear, fin and tube type intercoolers, force feed lubrication and controls for continuous or intermittent duty. Longitudinal and transverse cross sections with callouts highlight important construction features. Brochure includes a complete list of dimensions, weights and specifications for the units which can be furnished with or without drive.

Copies of Bulletin 203 can be obtained by writing to Clark Bros. Co., Division of Dresser Industries, Inc., Olean, N. Y.

Classified Advertising

All classified advertisements are payable in advance. Except for Positions and Help Wanted classifications, this section is reserved exclusively for USED equipment.

RATES: 20c per word; minimum 25 words. $2.00 per line for bold face headings: $15.00 per inch for line listings.

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6 direct expansion, ten station ammonia plate freezers, plate size 52 inches x 43 inches. Address reply to Box FB-3, % Industrial Refrigeration.

WANTED—used Frick shell ice maker Model A-100 or larger with or without compressor. State price and condition. Contact Hallam Engineering and Construction Corp., 80 Stanhope St., Brooklyn 21, N. Y. HIckory 3-5100.

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1— 10x10 York direct connected 100 h.p.
1— 10x10 York V-belt drive 125 h.p.
2— 5x5 Yorks 15 h.p. each.
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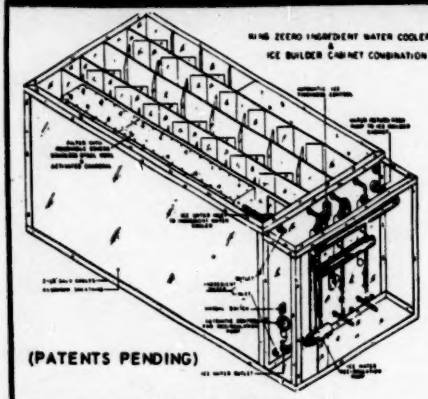

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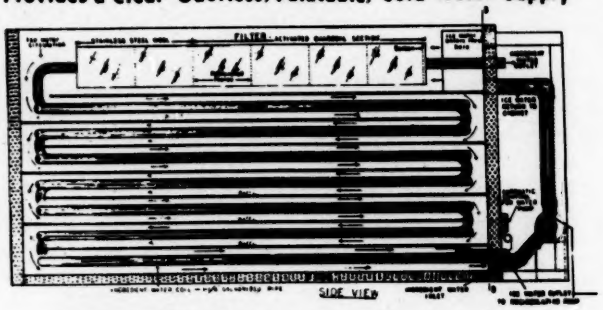
PURE WATER COOLER

Provides a Clear Odorless, Palatable, Cold Water Supply



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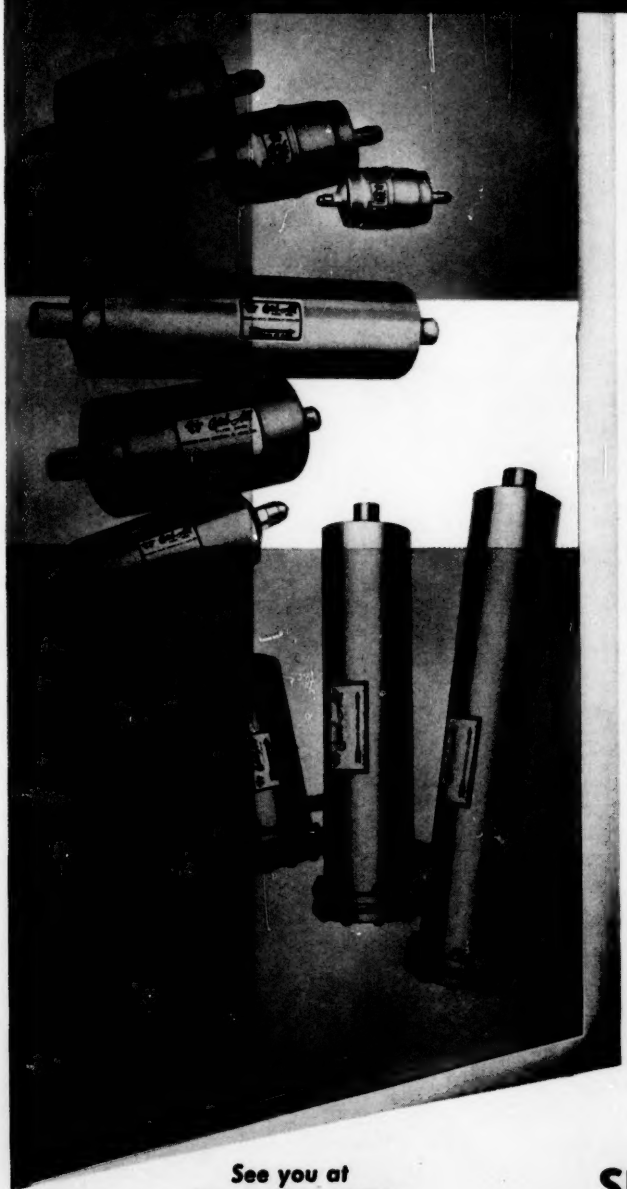

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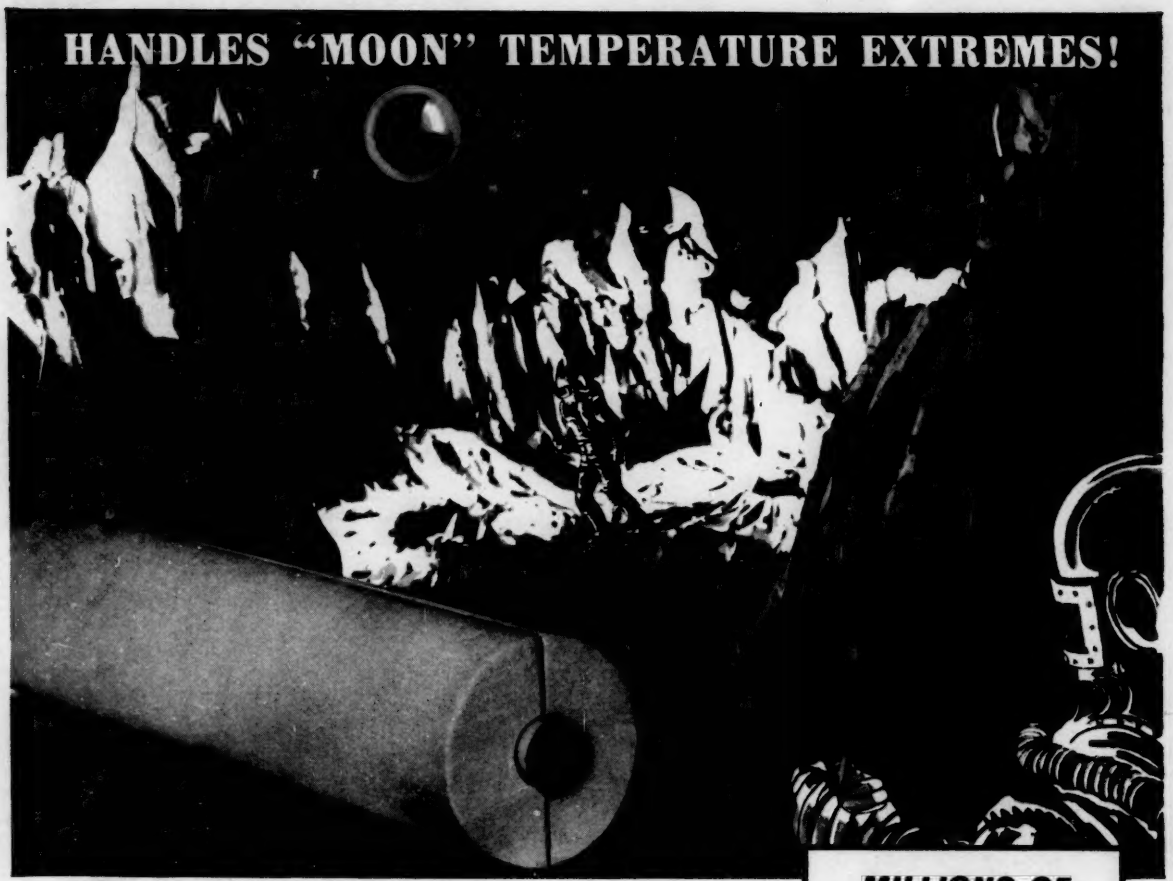

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